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ABSTRACT

During the six-year period (1975-80) the College of Technology of Temple University conducted an experimental project at the pre-college level aimed at the early identification of disadvantaged minority students seeking careers in engineering and/or engineering technology. The program was designed to encourage inner-city Philadelphia black and Puerto Rican 10-grade students who were proficient in mathematics and science to consider seeking careers in the fields of engineering technology. The program was jointly planned, executed, and evaluated by Temple University staff, Philadelphia School District teachers and counselors, and local business and industrial personnel. Ninety students participated in the project. The program's components included workshops, job placement, and job and career counseling. Results showed that 35% of the females and 27% of the males enrolled in engineering programs upon graduation. (Author/DS)

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AN EXPERIMENTAL ENGINEERING TECHNOLOGY CAREER PROGRAM for DISADVANTAGED MINORITY STUDENTS

COLLEGE OF ENGINEERING TECHNOLOGY

TEMPLE UNIVERSITY

THEODORE P. VASSALLO

PROJECT DIRECTOR

NOVEMBER 1980

SE 033 398

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Special thanks to our Management Committee which was responsible for managing our project and to the Planning Committee; to the various industrial and governmental agencies which provided jobs for our students and especially the IBM corporation which not only employed our students but also gave financial support for four consecutive years.

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Theodore P. Vassallo
Project Director

11/80

GENERAL BACKGROUND INFORMATION

In the early part of the past decade, American industry became confronted with a staggering dilemma in regard to the upward mobility of Black Americans and other minorities. Statistics on manpower utilization indicated that relatively few Black Americans and other minority groups entered the field of engineering and engineering technology. In an address by Smith,[1] he stated that "of 43,000 engineers graduated in 1971, only 407 were black and a handful were other minorities or women, one percent."

In a study of blacks in engineering by Lucius Walker[2] of Howard University, he indicated that in 1960 only one-half of one percent of the engineers in the nation were black and that proportion did not increase by 1970.

According to the Manpower Report of the President[3] delivered to Congress in March 1972, there would be an average demand for 48,000 engineering graduates and 33,000 engineering and science technicians each year to meet the nation's manpower needs between 1972 and 1980.

If we were to increase the number of minority engineering and technology graduates, it was apparent that the only acceptable solution was to take bold and innovative action to increase the supply.

In view of this, Temple University proposed to conduct an experimental career program for disadvantaged students to interest them in careers in the field of engineering technology. This project was an attempt to encourage the upward mobility of minorities in the field of engineering and engineering technology.

It was expected that students who completed this program would be strongly motivated toward careers in engineering and engineering technology and would wish to enroll in engineering curricula offered by colleges throughout the country.

DESIGN OF THE PROJECT

Temple University proposed to conduct an experimental career program for disadvantaged students at the Pre-College level. Minority students who have completed their ninth grade in high school would be eligible to participate in the experimental project. Experience had shown that many students were making career choices and needed additional information concerning the various opportunities in the field of engineering and engineering technology.

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1. "Needed: A Ten-Fold Increase in Minority Engineering Graduates." J. Stanford Smith, Senior Vice-President, General Electric Company, New York, July 1972.

2. "A Study of Blacks in Engineering." Lucius Walker, Howard University, Washington, D.C. 1972.

3. "Manpower Report of the President Delivered to Congress", Washington, D.C., March, 1972.

The engineering technology career workshop program was a joint effort of the College of Engineering Technology, the Philadelphia School District, and several local industrial firms that employed engineering personnel. The experimental project was divided into three phases covering a period of three years for each participating group. Three groups were selected to participate in the experimental projects (a bar chart is attached which explains the sequence of the various phases for each participating group in the appendix).

A. PHASE ONE - CAREER WORKSHOPS

Three faculty members from the College of Engineering Technology were assigned to conduct the Workshop. The workshop sessions were conducted at the College of Engineering Technology four days a week for six weeks beginning July 1, 1975. A group of fifteen students participated in each of 3 summer workshops who were recruited from the Philadelphia Inner-City schools with the assistance of the Guidance Counselors from these schools. The workshop sessions convened at 8:30 a.m. and dismissed at 12:30 p.m. Lunches and carfare were provided for the students by IBM Corporation during the Summer Workshop. The physical education facilities of Temple University were made available to the workshop participants during the afternoon hours.

Films and slides concerning the jobs in the various fields of engineering technology were shown. Engineering practitioners presented their experiences and challenges in engineering and engineering technology. Their visits were scheduled by the respective workshop instructors. They discussed career opportunities in the field of engineering and engineering technology. Class sessions on the application of mathematics and basic concepts in English were held to demonstrate how these basic tools were utilized in engineering technology. Hands-on laboratory experiments and demonstrations in electronics, mechanical and building construction technology were performed.

Guidance sessions to cover concepts on how to study, use of library, how to take tests, and how to get along in college were arranged. In addition, six industry visits were planned to enable students to gain first-hand knowledge of the practices in industry in the various fields of engineering technology.

B. PHASE TWO - HIGH SCHOOL PARTICIPATION

During the period when the students were attending their respective high schools, professional counselors from each school counseled and guided them relative to problems of a financial and personal nature. A professional counselor and member of the planning committee, interviewed the students periodically to discuss their progress in high school and counsel them accordingly. The mathematics coordinator, assisted the students with any problems in mathematics and the Science Department Head, endeavored to keep the students interested and motivated in the field of engineering technology.

The Project Director visited the high schools to assure continuity of the experimental project and check on progress of this phase of the program.

The Industrial Coordinator visited with students at their local high schools and discussed their assignments in industry scheduled during the second summer of the experimental project.

At least 3 follow-up sessions were conducted during the academic year for the three participating experimental groups. These sessions were scheduled on a Saturday morning to keep the students interested and motivated and they generally covered hands-on laboratory experiments in either electrical, mechanical, or civil engineering.

A fourth follow-up session was conducted by the Project Director to answer questions concerning College admissions, financial aid, summer work experience and occupational information relative to engineers and the opportunities in the field of engineering.

C. PHASE THREE - INDUSTRY COOPERATION

Local industry consented to provide jobs during Phase Three - the summer work periods of the experimental project for each participating group. A few of the industrial and governmental agencies that provided jobs were:

1. Atlantic-Richfield Company
2. Bell Telephone Company of Pennsylvania
3. Rohm & Haas Company
4. Philadelphia Naval Base - Engineering Section
5. City of Philadelphia - Streets Department
6. General Electric Company
7. I.B.M. Corporation
8. Philadelphia Electric Company
9. Temple University - Engineering and Physics departments

Interviews were conducted by representatives of these individual organizations with the students to determine their suitability for job placement. The Industrial Coordinator made periodic visits to the various plant sites to discuss any problems experienced by the students. Evaluation of student performance on the job was accomplished by the supervisor in charge. Also, students evaluated their job to determine if their experiences had contributed to an overall appreciation of engineering technology.

D. MANAGEMENT

The overall management of the experimental project was the responsibility of the Management Committee. This committee consisted of the Project Director who was responsible to coordinate all the activities of the experimental project, and representation from Temple University, the School District of Philadelphia and local industry.

The Planning Committee was responsible for the planning and operation of the experimental project. The committee consisted of three College of Engineering Technology faculty members who served as group leaders and a professional counselor from Temple University. Three members of the School District of Philadelphia and industry representatives comprised the other members of the Planning Committee.

E. EVALUATION

In order to make the overall evaluation required for this project, a research design was utilized that called for testing prior to Phase One of the career workshop. Each workshop group had approximately 60 students, who were tested from which 15 were randomly selected to serve as the experimental group and 15 students serving as the control group. Prior to the selection of the 30 students a concise set of guidelines was devised for use by the Philadelphia School Counselors regarding the criteria necessary for identifying and selecting the students who participated in the project.

Since one of the major goals of this project was to effectuate attitudinal change as well as provide for cognative growth and skill training a tentative plan was adopted which used the following instruments:

a. Aptitude Test - Differential Aptitude Test
b. Interest Inventory - Hackman/Gaither Interest Inventory
c. Attitude Survey - Career Perceptions of Adolescents

The purpose for selecting these specific instruments were:

a. A very low reading achievement level is required to complete each of the instruments.
b. The tests measure mechanical aptitudes from very low level skills to rather high level technical skills.
c. The inventory results would provide a broad base of interest patterns.
d. The information regarding attitudes could be valuable to the counselors who will be working closely with the students throughout the program.
e. The test results would not be sophisticated to the point where they would be difficult to interpret to each student in one-half hour conference.

To make the study as objective as possible, an independent evaluator was appointed to review, analyze and evaluate the overall findings of the experimental project.

CONTENT OF SUMMER WORKSHOP

A. ELECTRICAL ENGINEERING TECHNOLOGY WORKSHOP CONTENT

The Workshop Sessions in Electrical Engineering Technology were organized in accordance with the following content:

1. Formal Presentation

   a. Electrical Forces
   b. Concepts of Charge and Electric Fields
   c. Voltage
   d. Capacitance
   e. Stored Energy
   f. Industrial Uses of Capacitors

2. Demonstration of Electrostatics

   a. Van de Graff generators
   b. Electrometers
   c. Capacitors

3. Workshop Project I

   a. Build a cylindrical capacitor
   b. Determine the capacitance by electrostatic measurements
   c. Determine the breakdown voltage of the capacitor

4. Insulating Materials (Formal Presentation)

   a. Properties
   b. Effect in Manufacture of Capacitors

5. Workshop Project 2

   a. Build a cylindrical capacitor with an insulating material inserted between electrodes
   b. Determine its capacitance by electrostatic measurements
   c. Determine the breakdown voltage of the capacitor

6. Commercial Capacitor Manufacturing Techniques (Presentation)

   a. Manufacture of Capacitors in Electronics
      a. Discrete
      b. Integrated
   b. Manufacture of capacitors in Power Systems

7. Summary & Conclusions

Student performance was measured by the quality of their work in performance of the workshop projects. Each workshop was designed to have the student develop a piece of electrical hardware that would perform a useful function. The student was permitted to keep his project at the end of the workshop for a reminder of the session.

B. CIVIL ENGINEERING/CONSTRUCTION TECHNOLOGY WORKSHOP CONTENT

The Workshop sessions in Civil Engineering and Building Construction Technology was organized in accordance with the following content:

1. Introduction to Construction

   a. Importance of Structures
   b. Films - Civil Engineering and Construction

2. Structural Design

   a. Stress and Strain
   b. Tensile and Compression
   c. Force Systems

3. Construction Materials

   a. Concrete: 1. Composition mix design reinforcing (lecture and film).
      2. Mixing and Pouring of beams and cylinders (Class project).
   b. Steel: 1. General properties. Lecture
      2. Behavior under load. Lecture.

   c. Wood: 1. Properties - Lecture
      2. Competitive small group projects. Design and build truss.

4. Materials Testing

   a. Destructive testing of concrete and wood shapes built by class. Awards for strongest wood forms.
   b. Critique of testing. Failure modes. Discussion.

5. Construction Methods

   a. Visit two construction sites. One earthmoving and one high rise steel or concrete. (To be arranged).

6. Course Critique*

   a. Course Evaluation:
      Class solution of problems presented by a panel of faculty.
      Evaluation of student interest, response and acquired knowledge.
   S Student questionnaire indicating interest and effectiveness of various parts of the course.

7. Evaluation

a. Faculty Evaluation of Students

A panel presented a number of realistic problems to the class. Solutions were developed by leading the class through a sequential development of questions, answers and ideas. To insure participation, certain questions were directed to students by name. Every effort was directed toward maintaining the capability to judge the knowledge, interest, and enthusiasm of the students.

b. Student Evaluation of the Workshop

Students were asked to indicate their level of interest in various parts of the course and to provide any suggestions for future content.

C. MECHANICAL ENGINEERING TECHNOLOGY WORKSHOP CONTENT

The Workshop Sessions in Mechanical Engineering Technology was organized in accordance with the following content:

1. General Information

a. Lecture
b. Lecture - Current challenges in the field.
c. Film
d. Lecture by a registered professional mechanical engineer to explain registration.
e. A student's appraisal of mechanical engineering.

2. Mechanical Engineering Design

a. Market explorations.
b. Design - System engineering, project engineering, design engineering.
c. Design proposal, design specifications, design review, design approval.
d. Design costs.
e. Materials reliability, safety, environment.

3. Mechanical Engineering in the Manufacturing Process

a. Manufacturing Engineers, Plant Layout, Material Handling.
b. Quality Control Engineering.
Material testing, vibration analysis, product testing.
c. Sales Engineering
d. Installation Engineering

Guest lecturers and films will be used to support these topics.

4. Graphics as a bsic instrument of design.

a. Understanding the divisions of scales.
b. Understanding the metric scale.
c. Basic orthographic projection.

5. Design Project

   a. Choose a design project such as a chair, wagon, workbench, etc.
   b. Make drawings of project.
   c. Hold design review (student participation).

6. Present experiments relating to stress, strain, fluid mechanics, horsepower.

7. Evaluation

   a. How did this workshop increase your knowledge of the mechanical engineering profession?
   b. Do you feel that after having taken this workshop you are in a better position to decide in which field of engineering you wish to enroll?
   c. If this workshop were to be repeated, what improvements would you suggest be made to it?

Instruction evaluation will be based upon:

   a. Student participation and progress.
   b. Feedback from industry and participating lecturers.

SELECTION OF STUDENTS

To be selected as a participant in the experimental career workshop project, certain criteria were established. These required that students must be a member of a disadvantaged minority group. For the purpose of this study minorities included Blacks, Hispanics, Chicanos, and American Indians. Males and females were eligible who completed their ninth year in junior or high school prior to the summer workshop. Students were recruited who had a desire to continue with higher education and possessed the potential capability for bachelor's degree level of study. In addition, only those students who demonstrated aptitude and interest in mathematics, science, engineering and technology were accepted to be tested.

Final selection was made after students completed the application for admission to the NSF Career Workshop Program, were recommended by a guidance counselor, science or mathematics teacher, had been tested and interviewed by the Independent Evaluator and approved by the Management Committee.

NSF GROUP I

A. SELECTION OF STUDENTS

A total of 56 applications for admission to the 1975 Summer Career Workshop was received. Of this number, 52 students were present for testing. The Differential Aptitude test was administered under the supervision of Dr. Jerry Davis of the College of Education of Temple University.

Of the group tested, 30 students qualified under the criteria agreed upon for final selection of candidates for acceptance to the Career Workshop. Six of the eight parts of the Differential Aptitude Test were identified as being very important for students who desire to pursue careers in Engineering and Engineering Technology. These parts were: Verbal Reasoning, Numerical Ability, Abstract Reasoning, Mechanical Reasoning, Verbal Reasoning + Numerical Ability, and Space Relations. Any student who scored less than the 50th percentile in four of the six areas mentioned was eliminated from further consideration.

Twenty males and ten females fell into the accepted category. Fifteen candidates which comprised the experimental group were selected at random according to the local high school attended. The selection of the candidates was made by the Management Committee.

The following is the list of students selected who participated in the Experimental Group. Seven boys and eight girls were chosen.

Cooke Jr. High	- Anita Parker Trajan David Darryl Barber
Shoemaker Jr. High	- Jacqueline Egerton Judy Williams
Strawberry Mansion Jr. High	- Alice Fay Dove Donna (Burch) Thompson Keith Brennan Juliet Cantey
Martin Luther King High	- Tony Wilkerson Shawn Merke Wendell Williams Jonathan Windsor Denise Powers
Simon Gratz High	- Vanessa Mitchell

The following students were selected in the Control Group. Thirteen were boys and two were girls.

Martin Luther King High	- Lawrence Mason Anthony Armour Larry Holland Robert Beckett
Strawberry Mansion Jr. High	Cynthia Dunlap Hayward Laboo Darryl Marshall Leonard Scott Michael Simmons
Shoemaker Jr. High	- Lawrence Emery
Cooke Jr. High	- Warren Wheeler Darryl Nelson Keith Hutchinson Rhonda Greggs
Simon Gratz High	- James Brown

The School District of Philadelphia, Counselors and Principals of the various High schools, parents and all candidates were notified of the final selections to the Summer Career Workshop.

Several Counselors from Temple University visited each student tested at their local schools. They interviewed all students and counseled them based on the results of the Differential Aptitude Test.

B. PARENT-STUDENT ORIENTATION

All the students selected in the Experimental Group and their parents were invited to attend an orientation session. On Saturday, May 17, 1975 a Student-Parent Orientation meeting was conducted at the College of Engineering Technology. A review of the activities in the Summer Workshop was covered and a general discussion followed.

C. LIVING ON CAMPUS

By special arrangements with the UPWARD BOUND PROGRAM at Temple University, the students selected to participate in the 1975 Career Workshop had the opportunity to live on the campus for the last five weeks of the Summer Career Workshop.

D. SCHEDULE OF DAILY ACTIVITIES

The following is a schedule of the daily activities of the National Science Foundation Summer Career Workshop conducted at the College of Engineering Technology, Temple University from July 1 to August 7, 1975.

1st WEEK

1. July 1, 1975 -
   a. 8:15 A.M. - All students will report promptly to Room 304 Stauffer Hall (Southeast Corner Broad & Columbia Ave.) for initial meeting.

   b. 8:30 A.M. - 12:30 P.M. - Daily session on General Engineering information and Mechanical Engineering Technology area. Room to be assigned.

   c. 12:30 P.M. - Lunch - Johnson Dormitory

   d. 1:30 P.M. - Dismissal to go home.

2. July 2 & 3
   a. 8:30 A.M. - 12:30 P.M. - Report to Room 404 Stauffer Hall or other room to be announced. Daily sessions on Mechanical Engineering Technology.

   b. 12:30 P.M. - Lunch - Johnson Dormitory

   c. 1:30 P.M. - Dismissal to go home

2nd WEEK

1. July 6 (Sunday Evening) -
   a. 6:00 - 8:00 P.M. - Report to Peabody Hall Dormitory (Broad and Norris Streets) according to instructions received during May 17, Parents-Students Orientation and letter to be sent home.

2. July 7, 8 & 9 -
   a. 8:30 A.M. - 12:30 P.M. - All students report to Room 507 Stauffer Hall. Daily sessions in Electrical Engineering Technology.

   b. 12:30 P.M. - Lunch at Johnson Dormitory

   c. 1:00 - 3:00 P.M. - Interest Workshops in Yoga, Photography, Art, Arts & Crafts, etc.

   d. 3:30 - 5:00 P.M. - Recreational activities to be announced.

   e. 5:00 - 6:00 P.M. - Dinner - Johnson Dormitory

   f. 6:00 P.M. - Evening activities to be announced.

3. July 10
   a. 8:30 A.M. - Report to Room 404 - Stauffer Hall. Tour of industrial site to be announced.

   b. 12:30 P.M. - Lunch at Johnson Dormitory

   c. 1:00 - 3:00 P.M. - Interest Workshops in Yoga, Photography, Art, Arts & Crafts, etc.

   d. 3:30 - 5:00 P.M. - Recreational activities to be announced.

   e. 5:00 - 6:00 P.M. - Dinner - Johnson Dormitory

   f. 6:00 P.M. - Dismissal to go home.

3rd WEEK

1. July 13 - (Sunday Evening)
   All students report back to Peabody Dormitory. Specific time and instructions to be announced.

2. July 14, 15, 16
   a. 8:30 A.M. - 12:30 P.M. - Report to Room 404 - Stauffer Hall or other room to be announced. Daily sessions on Civil Engineering/Construction Technology.

   b. 12:30 P.M. - Lunch at Johnson Dorm.

   c. 1:00 - 3:00 P.M. - Interest Workshops as mentioned

   d. 3:30 - 5:00 P.M. - Recreational activities to be announced.

   e. 5:00 - 6:00 P.M. - Dinner - Johnson Dorm.

   f. 6:00 P.M. - Evening activities to be announced.

3. July 17
   a. 8:30 A.M. - Report to Room 404 Stauffer Hall. Tour of industrial site to be announced.

   b. 12:30 P.M. - Lunch - Johnson Dormitory

   c. 1:00 - 3:00 P.M. - Interest Workshops as mentioned.

   d. 3:30 - 5:00 P.M. - Recreational activities to be announced

   e. 5:00 - 6:00 P.M. - Dinner - Johnson Dormitory

   f. 6:00 P.M. - Dismissal to go home.

4th WEEK

1. July 20 (Sunday Evening) - All students report back to Peabody Dormitory. Specific time and instructions to be announced.

2. July 21, 22, 23 -
   a. 8:30 A.M. - 12:30 P.M. - Report to Room 404 Stauffer Hall or other room to be announced. Daily sessions on Mechanical Engineering Technology.

   b. 12:30 P.M. - Lunch at Johnson Dormitory

   c. 1:00 - 3:00 P.M. - Interest workshops as mentioned.

   d. 3:30 - 5:00 P.M. - Recreational activities to be announced.

   e. 5:00 - 6:00 P.M. - Dinner - Johnson Hall

   f. 6:00 P.M. - Evening activities to be announced.

3. July 24 -
   a. 8:30 - 12:30 P.M. - Report to Room 404 Stauffer Hall. Tour of industrial site to be announced.

   b. 12:30 P.M. - Lunch - Johnson Dormitory

   c. 1:00 P.M. - 3:00 P.M. - Interest Workshop as mentioned.

   d. 5:00 - 6:00 P.M. - Dinner - Johnson Dormitory

   f. 6:00 - Dismissal to go home

5th WEEK

1. July 27 (Sunday Evening)
   All students report back to Peabody Dormitory. Specific time and instructions to be announced.

2. July 28, 29, 30
   a. 8:30 A.M. - 12:30 P.M. - Report to Room 507 Stauffer Hall or other room to be announced. Daily sessions in Electrical Engineering Technology

   b. 12:30 P.M. - Lunch - Johnson Dormitory

   c. 1:00 - 3:00 P.M. - Interest Workshops as mentioned.

   d. 3:30 - 5:00 P.M. - Recreational activities to be announced.

   e. 5:00 - 6:00 P.M. - Dinner - Johnson Hall Dormitory

   f. 6:00 P.M. - Evening activities to be announced.

3. July 31

   a. 8:30 A.M. - 12:30 P.M. - Report to Room 404 Stauffer Hall. Tour of industrial site to be announced.

   b. 12:30 P.M. - Lunch - Johnson Dormitory

   c. 1:00 P.M. - 3:00 P.M. - Interest Workshops as mentioned.

   d. 3:30 P.M. - 5:00 P.M. - Recreational activities to be announced.

   e. 5:00 - 6:00 P.M. - Dinner - Johnson Dormitory

6th WEEK

1. August 3 (Sunday Evening) - All students report back to Peabody Dormitory Specific time and instructions to be announced.

2. August 4, 5, 6

   a. 8:30 A.M. - 12:30 P.M. - Report to Room 404 Stauffer Hall or other rooms to be announced. Daily sessions in Civil Engineering/Construction Technology.

   b. 12:30 P.M. - Lunch - Johnson Dormitory

   c. 1:00 - 3:00 P.M. - Interest Workshops as mentioned.

   d. 3:30 - 5:00 P.M. - Recreational activities to be announced.

   e. 5:00 - 6:00 P.M. - Dinner - Johnson Hall Dormitory

   f. 6:00 P.M. - Evening activities to be announced.

3. August 7

   a. 8:30 - 12:30 P.M. - Report to Room 404 Stauffer Hall. Tour of industrial site to be announced.

   b. 12:30 P.M. - Lunch - Johnson Dormitory

   c. 1:00 P.M. - 3:30 P.M. - Report to Stauffer Hall, Room 404. Student evaluation and follow-up instructions.

   d. 5:00 - 6:00 P.M. - Dinner - Johnson Dormitory

   e. 6:00 P.M. - Dismissal to go home.

E. WORKSHOP SESSIONS

The following is a detailed description of the activities conducted during the 1975 Career Workshop sessions.

1. MECHANICAL ENGINEERING TECHNOLOGY SESSIONS

a. Contemporary Engineering Challenges (July 1, 1975)
Motion Picture Presentations

The field of engineering and its challenges were explored, giving the students an insight as to the opportunities in this type of work. The aim was to interest the student that has an interest in science and/or mathematics in the field of technology.

Supplementing the lecture two motion pictures were presented "It's Your Turn", and "It's Your Turn to Steer". These films presented technology and its impact on our lives and strove to excite the viewer to act - to find solutions to the problems generated by technology thru technology - particularly the factors of waste and pollution.

Laboratory Inspection Trip

The students were given a walk-through introduction to the power, fluid and mechanical labs to wet their appetities for the lab work and demonstrations to follow. Several students displayed a keen interest in the capacities of the equipment and indicated considerable anticipation for what was to follow in the ensuing days.

b. Engineering - Social Problems (July 2, 1975)

The film, "Future Shock", based on the book of the same title by Alvin Toeffler, narrated by Orson Welles was shown. The social impact of too much change too fast - thru technological advancement was strongly presented. The film proved to be too "strong", too "shocking" for this age group. (It will not be used in future groups.)

Designing and Building a Product

The students were led thru the complete gamut of a production as seen in industry today: from the birth of a concept, through design, specifications, quotes, bids, budgets, purchasing, engineering, manufacturing, quality control to sales of the finished item. From this the student received a keen insight as to how things are actually done in the manufacturing industry.

Film and Discussion

"Engineering - Challenge of the Future " was presented and the students were stimulated to discuss their thoughts on possible future careers in engineering, the problems that exist and what they may be able to do about them.

c. Numerical Control (July 3, 1975)

History of mechanization, automation and automatic control theory in manufacturing were presented. Machine shop operations - metal removal through basic machine methods was discussed. Interest in the use of computers to produce the six-track tape that is fed into the machines was generated.

Power Lab Demonstration

The following was presented: Sterling Engine (hot air cycle); Diesel Engine with dynanometer to measure horsepower, speed and torque; Otto Cycle Engine (transparent cylinder to show firing of engine) and exhaust emission analyzer. Theory of engines and related principles were discussed.

Guest Speakers - Hudson Engineers

The students were fascinated as well as keenly interested in the concepts presented by the Hudson Engineers on their Off Shore Ports. The need, principle, engineering and future of the project elicited much discussion.

d. Fairchild Movie (July 21, 1975)

"Dr. Vernher von Braun Says... It's Your Turn" shows an interview with students. He answers questions based on his experience and his feelings for the future as related to technology. He emphasized the relevance of the study of science and the involvement in environmental vocations. Our students realized as a result that the world belongs to the young and it is their turn now to do something about it.

Laboratory Equipment

Much of the equipment in the Fluids Lab and in the Mechanical Lab was demonstrated with considerable hands-on experience for the students. They operated the controls, opened and closed valves, made weighings and readings, calculated data and results and gained familiarity with fluid experimentation and applications, mechanical testing of steel and other metals and other metals and hardness determinations through three types of testers.

e. The Libraries (July 22, 1975)

The group was exposed to the intricacies and workings of the Paley Library and the College of Engineering Technology Library through guided tours by our librarian and representatives from Paley. They were encouraged to browse and as a result a number of books (technical in nature) were checked out.

RCA Speakers

Two excellent presentations were made by the guests, highlighted by the films, models and equipment shown and, in particular, the samples given the students of materials used in lunar antennas. Active participation by the students in the discussion period followed the presentations.

f. "Mechanical Engineering" (July 23, 1975)

"Mechanical Engineering" film presentation served to answer for the students what mechanical engineering specifically is all about and served to help answer the question raised in the earlier films, What can be done?

"Citicar"

The all-electric automobile was shown, described and discussed. The students had an opportunity to ride in the innovative vehicle and enjoyed the demonstration thoroughly.

Drawing

The students were introduced to the drawing boards and drafting machines and had an extensive session using them. The projects were from elementary to complex and a surprising ability was exhibited by several of the participants.

g. Field Trip to"Second Sun". (July 24, 1975)

The trip to the nuclear power plant and the ship "Second Sun" was the high-point of the two weeks with the mechanical department. We observed the construction of a nuclear power plant and saw demonstration models on nuclear energy in action. The plant is under construction by the Public Service Electric and Gas Company with the United Engineers and Constructors, Inc. as the prime contractor.

2. ELECTRICAL ENGINEERING TECHNOLOGY SESSIONS

a. EET - Session 1 - Basic Electricity (July 7, 1975)

Introduction to the Electrical Engineering Technology Program & Instructors
Tour of Lab Facilities
Film Strip - How Electricity Works and Discussion
Demonstration

Threshold of Feeling using a voltage stimulator to provide the voltage source and an oscilloscope to make the reading. Student volunteers had their Threshold of Feeling determined.

Electrical Safety Demonstration

Principles of electrical energy storage and discharge were demonstrated in a capacitor. Principles of electrical energy dissipation when a circuit overload is present were discussed and demonstrated by an experiment involving electrical fuses.

b. EET - Session II - Simple Circuits and Resistance (July 8, 1975)

Discussed Ohm's Law. Introduced series with more than one resistor. Presented several examples showing the derivation of equivalent resistance, current and/or voltage using Ohm's Law.

Individual Project

With batteries and LC/EFC buls; Each student built a quiz game - (logic board) consisting of a 9-V battery and a light bulb. A single wire was connected between 2 paper clips which represented the question and the correct answer. Simultaneously connecting wires to the corresponding 2 paper clips would complete the series circuit therefore causing the bulb to light.

Parallel Circuits

Discussed equivalent resistance of several parallel resistors. Solved several example problems and explained that excessive appliances connected in parallel would reduce the equivalent resistance - causing excessive current and blown fuses.

Individual Experiment with Series and Parallel Resistance

Each student measured 2 or more resistors connected in series and recorded results. Measurements were also made of 2 or more resistors connected in parallel. This demonstrated that the value of the parallel equivalent resistance is always less than any one individual resistance.

Review and discussion of individual results.

c. EET - Session 3 - A.C. Circuits - Inductance and Capacitance (July 9, 1975)

Cathode-Ray Oscilloscope

A demonstration of the oscilloscope with signals from a signal-generator-sine-waves, square waves and Lissajou figures was presented.

After demonstration the students were divided into groups and assigned to a scope and generator for hands-on experience.

Inductance & Transformers

Inductances were previously fabricated using spikes for cores. Demonstration showed that with d.c. excitation the inductors acted as magnets. A second coil was wound on an inductor and it was demonstrated by the use of an oscilloscope and signal generator that a voltage was induced in the second coil. The importance of this principle and its application in supplying energy to homes and industry was explained.

Individual Projects with Inductors and Transformers

The students were given inductors and were able to demonstrate the magnetic properties. They were furnished with magnet wire and hand-wound this to provide a second coil in their inductor. They then used the signal generator and oscilloscope to demonstrate the magnetic coupling between the two coils.

Capacitors - Review

It was demonstrated that a capacitor can store energy. A D.C. current was connected to a capacitor through a vacuum-tube voltmeter to show the change in current as the capacitor charged. The capacitor was then discharged. The accompanying arc and noise showed that energy had been sotred and the lighting is an electrical discharge.

A capacitor in series with a resistor was connected to a signal generator, an oscilloscope displayed that capacitors can be used as elements of A.C. circuits.

A review of the material covered in this session was then conducted.

d. EET - Session IV Semiconductor Electronics and Circuits (July 28, 1975)

The operation of a diode and transistor was carefully explained.

Electronic Experiments

Each student received an electronic kit which had the versatility of performing to different experiments. All students did at least 8 of the experiments. The components were all assembled except for connecting wires and the addition of a pen-light battery which varies from one experiment to another. The student made three types of radios, a transmitter, an amplifier, a signal tracer, a Morse Code oscillator, a home burglar alarm, a signal injector, and an audio frequency oscillator. The students learned systematic wiring and trouble shooting of a circuit.

The kit was presented to the student as a gift at the end of the session.

e. EET - Session V - Computers (July 29, 1975)
Introduction to Computers

An introductory lecture on the general organization of the Computer was given followed by an explanation of basic topics such as data processing, input-output techniques, the binary system, time sharing digital analog conversion, BASIC and other programming languages.

Tour of the Temple University Computer Center

The students were introduced to the general computer hardware and observed the interface with the Control Data Corp. 6400. The students were then split into two groups for laboratory practice. While the first group worked on tele-typewriters which were connected to the Temple University Computer Center, the Second Group was introduced to a PDP-11 computer with graphic displays where each member of the group "played" against the computer.

Computer Graphics

Three systems were simulated on the computer. 1. The dynamics of the lunar module landing on the mooon. (The student had to land the lunar module safely on the moon's surface.) If the landing was too fast or landed in an inappropriate place the lunar module blew up etc. 2. A ping-pong type game was simulated and two students were able to play against each other. 3. Other students decided to use a missible and anti-missile war game in space to compete with each other.

Teletypewriters - Time Sharing

Four programs were stored in the central computer in the BASIC language. The students called for each of these programs by typing the command on the teletypewriter, typed in their own input data and watched their results typed out. The specific activities were:

1. Students typed names of several friends - All names were alphabetized
2. Students typed names - Individual membership cards were printed
3. Students typed 2 lengths of a triangle - The third length was printed
4. Students typed system command - Pascal traingle was printed.

f. EET - Session VI - Biomedical Engineering Technology (July 30, 1975)
The Cardiac Vascular System

Various physiological systems in the human body were mentioned and briefly illustrated. The cardiac vascular system in particular was considered from an engineering point of view. It was considered as a transportation system which moved nutrients and oxygen to the muscles propelled by a double pump which is in the heart. It was realized that the heart is a very special organ which contains three over riding natural pacemakers. Cardiac assists with artificial pacemakers was discussed and illustrated.

Pacemakers and Biomedical Engineering Materials

Cardiac assist with artificial pacemakers was discussed and illustrated. A pacemaker with its electrodes was demonstrated. Various biomedical engineering for vascular grafts (knit dacron artificial arteries) were discussed and demonstrated. Transplantation of artificial organs was briefly mentioned.

Transducers and Medical Instrumentation Laboratory

A brief introduction of several transducers was made and various medical instruments explained and demonstrated. In particular, the heart rate of a frog was observed on a physiograph, the blood pressure of a student was measured with a crystal transducer attached to his finger. Also the polygraph or "lie detector" with its various transducers and output graphs was explained. Several subjects were connected to the polygraph, one-at-a-time, and asked to respond to various questions. In most cases the students who were observing the output graphs, could easily see if the subject was telling the truth.

Electrical Safety

Electrical Safety in the home and hospital was discussed, and the idea of grounding isolation, and leakage current was introduced. Threshold of feeling was demonstrated and electrocution and defilibrillation discussed.

g. Field Trip - Emergency Care Research Institute (July 31, 1975)

The students visited ECRI in Philadelphia, a unique institute, which tests biomedical engineering instruments, materials, devices, and at time, major systems for hospitals and the medical profession. Arrangements were made so that four engineers who were recent students of one of the instructors were the primary hosts. They showed the group their projects, their work, and their responsibilities. For example one recent graduate is responsible for evaluating every single medical splint on the market. He demonstrated several specimens on the students. Another recent graduate was responsible for evaluating gas valves. A third studied portable pacemakers and used students to demonstrate a particular one. A fourth recent graduate worked with pacemakers. In each case the methods of approach, experimental procedures and final evaluation techniques were outlined. It demonstrated to the students the fact that an engineering degree is a faster road to major responsibilities than any other undergraduate degree.

3 CIVIL & ENVIRONMENTAL ENGINEERING TECHNOLOGY SESSIONS

a. Introduction (July 14 - 17, 1975)

Session 1 was an introductory session in which the students were given a slide presentation about concrete as a structural material. The presentation covered the areas of mixing, placing and handling of concrete along with a discussion of the principle of reinforcing concrete with steel. The slides showed concrete members being in place at a job site and being precast in a precast contractor's supply yard. The methods of pretensioning and post-tensioning for prestressed concrete were illustrated. The session ended with a discussion of places where concrete construction could be observed on the Temple University campus and at the Philadelphia International Airport where the students were to take a trip later in the week.

Demonstrations of Basic Ingredients of Concrete

Session 2 was a demonstration session. The instructor showed each basic ingredient which goes to make-up concrete, namely cement, water, sand, gravel and air. The sand and gravel were further discussed as to their particle size distribution, fineness modulus, and maximum particle size as specified by the American Society of Testing and Materials specifications. The session was concluded with a bar graph presentation of the approximate percentages of the basic ingredients which go to make-up a volume of concrete.

Film Presentation of Portland Cement

Session 3 was a film presentation of the making of portland cement. The film was furnished by the Portland Cement Association and was entitled "Mountains to Microns".

Laboratory

Session 4 was a laboratory workshop in which the students performed sieve analyses of both fine and coarse aggregates which were later used in preparing a concrete mixture. The class was divided into four groups. Two groups did the sieve analyses for the fine aggregate and the other two groups did the sieve analyses of the coarse aggregates. The information obtained from the analyses were recorded on standard forms prepared by the instructor. After the analyses were completed the data were submitted to the instructor who summarized the data and reported the results to the students at a later session. A comparison of the results between each of the groups was used to demonstrate the concept of statistical sampling. The analyses were to obtain maximum size of the coarse aggregate, the fineness modulus of the fine aggregate and the percentage by weight of the various particle size distributions.

Demonstration of Specific Gravity

Session 5 was a demonstration session in which the specific gravity of the coarse and fine aggregates was determined. The fundamental concept of the displaced volume of water by a solid was used to determine the volume of the coarse and fine aggregate. A 1000 m. graduate was filled to the

1000 ml. mark on the graduate and a weighed sample of the aggregate was poured into the graduate. The water that was displaced above the 1000 ml. mark was measured. Thus, the millimeters of water displaced equaled the cubic centimeters of the submerged aggregate. The weight of the sample of aggregate divided by its volume determined the specific gravity. The students participated in the demonstration by reading the weights and volumes as indicated on the measuring equipment.

Film Presentation

Session 6 was a film presentation about the proper method for proportioning the ingredients in a concrete mixture. The film was furnished by the Portland Cement Association and was entitled "Principles of Quality Concrete".

Computations

Session 7 was a computation period. The instructor gave the students the results of their laboratory tests and showed how the information related to the computation for determining the weight of each ingredient which goes into a concrete mixture. The Portland Cement Association "Quality Concrete Design" manual was used as a reference guide by each student. The instructor set the design parameters for strength and slump. He then went through each mathematical calculation for determining the weight of each of the ingredients that the students would be required to measure in the laboratory when making their concrete mixture.

Demonstration of Concrete Mixture

Session 8 was a demonstration session in the laboratory to show each piece of equipment the students would be using to make their concrete mixture.

Laboratory

Session 9 was a laboratory workshop in which the students measured the amounts of materials they needed in their particular mixture. The students then batched the materials in a concrete mixer and finally placed the batched concrete into 6 inch diameter concrete molds. The molds were left to harden and to be tested for compressive strength three weeks hence.

b. Introduction to Civil Engineering (August 4 - 7, 1975)

Session 1 was an introductory session in which the instructor reviewed some of the observed civil engineering activities that the students had seen at the Philadelphia International Airpot and The Temple University Campus during the past three weeks.

Lecture on Surveying

Session 2 was a lecture session. The instructor discussed various types of work a civil engineer could do which lead into work opportunities in surveying. The discussion covered various types of surveying, the mathematical requirements of surveying and the instruments used by surveyors to obtain data.

Demonstration of Surveying Equipment

Session 3 was a demonstration session in which the level, Philadelphia rod and transit were discussed in detail as to how each piece of equipment operated and what measurements could be observed with the equipment.

Field Laboratory Problem

Session 4 was a field laboratory. Three instructors layed out surveying problems on a campus mall. Problem 1 was to use the level and the Philadelphia rod to measure differences in elevations of several points located in the mall. Problem 2 was to use the transit, a 100 foot tape and the Philadelphia rod to measure distances, horizontal angles and vertical angles. Problem 3 was to use the elctronic measuring device to determine horizontal distances to various points in the mall. The students were divided into three groups of 5 students each. Each group performed each problem. The students rotated duties associated with each problem so that exposure to the over-all scope of the problem was obtained.

Lecture on Environmental Engineering

Session 5 was a lecture session in which outside speakers from the Environmental Protection Agency discussed the areas of air pollution, water treatment, and solid waste disposal.

Computations

Session 6 was a computation period. The data of the surveying problems were summarized and given to the students. The students applied the data to trigonometric relationships that the instructor showed on the background in order to obtain elevations, horizontal distances and vertical distances such as the height of a classroom building adjacent to the mall.

Laboratory

Session 7 was a laboratory session in which the students crushed the concrete cylinders they had previously made. The students operated the testing machine and recorded the failure load for each cylinder. The data were summarized and the goodness of quality control they had achieved was discussed. The results indicated excellent quality control.

Film

Session 8 was a film session in which the work done by a civil engineer was summarized in a film entitled "The Invisible E".

F. FOLLOW-UP SESSIONS OF 1975 CAREER WORKSHOP GROUPS

Two follow-up programs were scheduled in February and April of 1976 for the students who participated in the 1975 Summer Career Workshop Program. The follow-up sessions were conducted to keep in personal touch with these students and to provide some activities to motivate them and keep their interests viable in the field of engineering technology.

1. Follow-up program February 21, 1976

The follow-up program in February emphasized Civil Engineering. Fourteen students attended and the one student missing was unable to attend due to illness. Dr. R. J. Stone and Professor Theodore Green were the attending staff members.

The workshop involved the student into making and testing wooden beams and columns of different cross-sectional configurations and different methods of connecting the pieces of the beams and solumns together. The cross-sectional configurations were solid rectangle, wide flange and box shapes. The methods used to secure the pieces together were 5 minute setting expoxy glue, nails; and nails and glue. The assembling took approximately 2 hours.

After the members were constructed, the students were then taken to the materials testing laboratory. In the laboratory, the beams and columns were loaded to failure and each student recorded the failure load as indicated on the load dial of the testing machine. The results of the testing showed the students the effect of cross-sectional configurations on the stiffness and load carrying capacity of beams and columns of the same length and type of loading condition. The testing took approximately 1 hour. A summary of the results was presented by Professor T. Green.

2. Follow-up program April 24, 1976

This follow-up session stressed the area of Mechanical Engineering Technology. Twelve students were in attendance at this session. One student was ill and the others had other commitments and were unable to be present. Professor A. T. Greenspan and Professor Harry Pfeffer were the instructors conducting this session.

Mr. F. S. Woerth was introduced by Mr. Greenspan to the group. He explained the procedures for the students to follow at their respective high schools with their Guidance Counselors and Advisors with reference to summer employment and the summer schedule of activities for the group. Mr. Greenspan then gave directions about the workshop procedures. The students then reassembled in Room 401 where the drawing boards and drafting machines were set up.

The first assignment was a choice of one of the exercises utilizing the straight edge, scale, triangles and compass. Before the students started one of the problems, they were given a demonstration on how to properly sharpen and identify the various pencils and leads for the compass. Mr. Pfeffer was the instructor at this point.

The use of the triangles, scale and compass were reviewed by Mr. Pfeffer. While the students were drawing a problem, Mr. Greenspan and Mr. Pfeffer circulated among the tables giving individualized assistance. Most of the students were interested in their projects and those who were not particularly enthusiastic about drawing, had never had any type of mechanical drawing exposure previously. After about one hour of this introductory practice the second project was explained. A telephone dial was shown as an example of the type of product that was important in our lives. Mr. Pfeffer distributed the instruction sheet and a drawing of a telephone dial plate. The

students were instructed to enlarge the illustration to double size and to include dimensions on their drawings. This project was completed on the tracing paper. Most of the drawings were of good quality and surprisingly a few students were able to complete their drawings before the end of the period.

G. HIGH SCHOOL PARTICIPATION (Phase Two)

Mr. Benjamin Dudley, of the Mathematics Office of the School District of Philadelphia was responsible to visit all the students at their local high schools during the academic year. His report, filed at the end of the academic year 1975-76 was as follows:

During the academic year I visited the various schools of the students in the TEMPLE TECHNOLOGY SUMMER PROGRAM to follow up on their progress.

I feel this to be an extremely important function because it helps to tie in the students' summer experiences with their overall academic pursuits.

I talked with the student's counselors', math and/or science teachers to inform them of the students involved in the Temple Program. In some instances the teachers were not aware of the program or the students participation. In too many cases the students were not singled out for their summer accomplishments. Therefore it is my aim to make these students visible but to identify the students to the schools that they have been participants.

Keeping the teachers and counselors informed of the students participation is basically my objective but I've talked to some of the students' parents as well. Parental involvement is an invaluable dimension in the success of any program.

In talking to the students on a one to one basis I found them to be highly enthusiastic. One student was so impressed with the program that he visited his former school and thanked his teacher personally for recommending him for the program.

Some of the general comments of the students were as following:
... they all enjoyed manipulating the equipment, actually working on the various machines was best... testing and watching the experiments... all the teachers were responsive and sensitive and left great impressions ... (the Civil Engineering lectures they felt were a wee bit long)... the Biomedical experiences and their opportunity to dissect, ranked high among their numerous experiences.

Generally it was felt that most of the students could profit more if there were mathematics classes which had more application of engineering concepts involved in the daily lessons. This concern has been acknowledged and is presently being resolved.

In conclusion I feel that the program has left a tremendously positive impact on the students, attending daily classes on a college campus, enjoying the opportunity of learning first hand engineering concepts all blended to excite, impress and motivate them to continue their education with a possible career in engineering as their goal.

H. SUMMER OBSERVER EXPERIENCE

The following agencies were contacted by the College of Engineering Technology Coordinator of Industrial Relations to obtain jobs for the NSF I group for the summer of 1976.

1. City of Philadelphia - Larry Moy
2. ARCO (Palmers) - Joe Sanborn
3. United Engineers - Marty Lastowka
4. Sun-Oil - Bob Lynch
5. DuPont - Gordon Tibbetts
6. G.E. (32nd St.) - Salina Gary
7. G.E. (Valley Forge) - Sarah Smith
8. Philadelphia Electric - Tom Rowe
9. IBM - Bill Yamello
10. IBM - Jack Scully
11. Naval Ship Engineering Center - Carl German
12. Naval Ship Engineering Center - Odella King
13. Rohm & Haas - Jack Geisel
14. U.S. Steel - Al Joyce
15. Neighborhood Youth Corps - Willie Maddox Jr.
16. Neighborhood Youth Corps - James Barner
17. Budd Company - Louise Jerkins
18. Sperry-Univac - Charles Sigg
19. Negro Trade Union Leadership Council - Robert Robinson
20. Human Resource Development Institute - Ben Stahl
21. Atlantic Richfield Co. - Mike Vercillo
22. Bell Telephone Co. of Pa. - Nick Williams
23. Boeing Vertol - Tom Warren
24. FMC Corporation - James Kaag
25. Scott Paper - Ernest Williams Jr.
26. Sun Company - Earl Pearce
27. Westinghouse Corporation - Perry Watkins
28. City of Philadelphia - Emily Clark & Charles Thorpe
29. Philadelphia Urban League - Robert Shannon
30. NAACP - Leroy Green
31. Xerox Corporation - Frank Search
32. United Engineers - Marty Lastowska

I. SUMMER WORK EXPERIENCE NSF GROUP I (Summer 1976)

All the students who participated in the 1975 Career Workshop were assigned to positions in various industrial and governmental organizations. Two, however, did not accept their assignments. One of them was recently married and requested a summer leave of absence while the other went south to visit her Grandmother for the summer period.

The following is a list of the students and the organization to which they were assigned for their 1976 summer work experience.

	NAME OF STUDENT	SPONSORING ORGANIZATION
1.	Darryl Barber	Philadelphia Naval Base - Engrg. Dept.
2.	Keith Brennan	Philadelphia Electric Company
3.	Donna Burch	Summer Leave of Absence
4.	Juliet Cantey	General Electric Company
5.	Trajan Davis	Bell Telephone Company
6.	Alice Dove	Philadelphia Naval Base - Engrg. Dept.
7.	Jacqueline Egerton	IBM Corporation
8.	Shawn Merke	Philadelphia Naval Base
9.	Vanessa Mitchell	Rohm & Haas Co.
10.	Anita Parker	Philadelphia Naval Base - Engrg. Dept.
11.	Denise Powers	IBM Corporation
12.	Tony Wilkerson	Atlantic Richfield Co.
13.	Judy Williams	Summer Leave of Absence
14.	Wendell Williams	General Electric Company
15.	Jonathan Windsor	City of Philadelphia - Engrg. Dept.

On the job visits were made to all industrial firms and governmental agencies. All participants were doing very well and the comments by the employers indicated that they were well satisfied with these NSF I students.

2. INDUSTRY EVALUATION CRITIQUE

On October 23, 1976, Mr. F. Stanton Woerth, the Coordinator of Industrial Relations met with groups NSF I to discuss their summer work experiences. All agreed that their summer work experiences were most valuable which contributed greatly to their desire to select engineering as a career.

Those students who were paid a stipend for their services were especially pleased with their summer work experiences position. Those who were not paid a stipend did receive carfare and lunch money from an IBM grant for the days out in industry. While they were not compensated for their services, they all felt that the experience gained contributed greatly to their background in engineering.

3. SUMMER WORK EXPERIENCES NSF GROUP I (Summer 1977)

	NAME OF STUDENT	SPONSORING ORGANIZATION
1.	Darryl Barber	Naval Ship Engineering Center
2.	Keith Brennan	Philadelphia Electric
3.	Donna Burch	Leave of Absence
4.	Juliet Cantey	General Electric
5.	Trajan Davis	Bell Telephone of Pa.
6.	Alice Dove	Naval Ship Engineering Center
7.	Jacqueline Egerton	IBM
8.	Shawn D. Merke	Naval Ship Engineering Center
9.	Vanessa Mitchell	Rohm & Haas
10.	Anita Parker	Naval Ship Engineering Center
11.	Denise Powers	IBM
12.	Tony Wilkerson	Leave of Absence
13.	Judy Williams	Leave of Absence
14.	Wendell Williams	General Electric
15.	Jonathan Windsor	City of Philadelphia

3. SUMMER WORK EXPERIENCES NSF GROUP I (Summer 1978)

The first NSF Career Workshop Group which started in the Summer of 1975 completed high school in 1977. According to our original proposal, we were not obligated to obtain summer work experiences after graduation. However, we were very fortunate to place several of these students in paying positions. A list of these students and the company which employed them is noted below:

NAME OF STUDENT	SPONSORING ORGANIZATION
1. Darryl Barber	Philadelphia Naval Base - Engrg. Dept.
2. Keith Brennan	City of Philadelphia - Streets Dept.
3. Juliet Cantey	General Electric Company
4. Trajan Davis	Part Time Job
5. Alice Dove	St. Christopher's Hospital
6. Jacqueline Egerton	Philadelphia Naval Base - Engrg. Dept.
7. Shawn Merke	Philadelphia Naval Base - Engrg. Dept.
8. Anita Parker	Philadelphia Naval Base - Engrg. Dept.
9. Judy Williams	City of Philadelphia - Streets Dept.
10. Wendell Williams	General Electric Company

Donna Thompson, Denise Powers, and Jonathan Windsor were seeking employment from other sources. Vanessa Mitchell did not prefer to take a job this summer. She wants to concentrate on summer school course work while Tony Wilkerson decided to enter the military service.

I. COLLEGE PLANS

1. SUMMARY OF NSF I COLLEGE PLANS (Experimental Group)

Name	College or University	Program of Study
1. Wendell Williams	University of Penna.	Electrical Engineering
2. Jonathan Windsor	Temple University	Mechanical Engineering
3. Alice Dove	Drexel University	Electrical Engineering
4. Judy Williams	Villanova University	Electrical Engineering
5. Juliet Cantey	General Motors Institute	Electrical Engineering
6. Keith Brennan	Penn State University	Civil Engineering
7. Shawn Merke	Lehigh University	Civil Engineering
8. Vanessa Mitchell	Temple University (Spr'79)	Electrical Engineering
9. Trajan Davis	University of Indiana (Pa.)	Pre-Medical
10. Darryl Barber	Gwynedd Mercy College	Medical Technology
11. Donna Thompson	Philadelphia Community Coll.	Nursing
12. Denise Powers	Postpone 1 year	Electrical Engineering
13. Jacqueline Egerton	Postpone 1 year	Biomedical Engineering
14. Anita Parker	Married - No plans	
15. Tony Wilkerson	Military Service	

SUMMARY OF NSF I COLLEGE PLANS (Control Group)

Name	College or University	Program of Study
1. Larry Holland	Villanova University	Engineering
2. Warner Wheeler	Bucknell University	Electrical Engineering
3. Anthony Amour	Drexel University	Business Administration
4. Robert Beckett	Pierce Jr. College	Accounting
5. Cynthia Dunlap	West Chester State	Math Education
6. Rhonda Greggs	Swarthmore College	Biology
7. Haywood LaBoo	Swarthmore College	Pre-Medical
8. Darryl Marshall	North Carolina Central	Accounting
9. Leonard Scott	Lock Haven State	Computer Science
10. Michael Simmons	Drexel University	Business Administration
11. Darrin Nelson	Postpone 1 year	Law
12. Lawrence Emergy	Working	Auto Mechanic
13. Keith Hutchinson	Working	No Choice
14. James Brown		Military Service
15. Lawrence Mason		Military Service

A review of the data on the NSF I group revealed that our project seems to have accomplished its prime objective which is to encourage minority students to enroll in various engineering colleges throughout the United States. Of the fifteen students participating in this project, eight were enrolled in an engineering or engineering technology bachelor's degree program. Three others were registered in a science related program in colleges while two others enrolled in engineering in September 1979.

Another student who was planning to enroll in engineering in September 1979 decided to marry. One other individual went into the military service. Thus of the original fifteen student, 10 were in engineering or enrolled in the fall.

The data on the control group indicates that only two of the original fifteen enrolled in an engineering school. Eight were registered in some type of college program and one other enrolled in pre-law in the fall of 1979.

A. RECRUITMENT OF 1976 SUMMER CAREER WORKSHOP GROUP (NSF Group II)

Recruitment of the 1976 Summer Career Workshop Group began in the Fall of 1975. Mr. Irvin Schwartz, Assistant Director of Mathematics and Mr. Benjamin Dudley, Assistant Director of Mathematics, of the School District of Philadelphia were the prinipal recruiters. The students from the following Jr. High Schools were considered for acceptance in the program.

1. Barratt Jr. High School
2. Bartlett Jr. High School
3. Beeber Jr. High School
4. Penn Treaty Jr. High School
5. Stoddart-Fleisher Jr. High School
6. Sulzberger Jr. High School
7. Wanamaker Jr. High School

Forty-six applications were received for admission to the 1976 Summer Career Workshop program. These students were highly recommended by their respective mathematics, science, or guidance counselors as having real potential to succeed in engineering technology.

B. SELECTION OF STUDENTS

The 46 students who applied for admission were tested on March 6, 1976. The testing program was administered under the supervision of Dr. James P. Smith, Jr., our chief counselor psychologist.

It became evident from the small group tested and the results of the actual testing that the procedures used for selecting the students in 1975 were not appropriate for use in 1976. These results indicated that only three students met the criteria used to select last year's students. On checking the possible causes of these differences with the Mathematics Department of the School District of Philadelphia, it was noted that the background of these students were not as strong as the previous group. These students came from sections of the city which apparently reflected their lack of educational background. However, on interviewing these students, it was felt that they did have some potential to succeed in the program. In light of this situation, it was decided by the management committee to select the top fifteen students based on their mean percentages across the six subtests that wer used to select students in 1975. The six areas are: verbal reasoning, numerical ability, verbal reason plus numerical ability, abstract reasoning, mechanical reasoning, and space relations. The mean score based on the percentage of the six subtests of the DAT was 42.39 for the 1976 summer career workshop group. Last year, the mean score reported for the 1975 summer career workshop group was 54.24.

This division yields an even distribution across the sexes for the fifteen students selected. One of the schools was not represented in the final selection. This was Stoddart-Fleisher Jr. High School.

The following fifteen students were selected from the total group tested to participate in the experimental group for the Summer Career Workshop which began on July 6, 1976 and continued through August 12, 1976.

Barratt Jr. High	Nyoka McCrimmon
Bartlett Jr. High	Aretha M. Johnson Larry Thomas
Beeber Jr. High	Michele Crump
Penn Treaty Jr. High	Brenda Lee Crayerling M. McGhee Rubin Rios
Wanamker Jr. High	Francheska P. Hamilton Michael A. Jennings Ronald K. Johnson April C. Myers Leah M. Oles Gail E. Russell Thelodis A. Strickland
Sulzberger Jr. High	Anthony T. Thomas

The following is a list of fifteen students who were selected as a control group for the Summer Career Workshop of 1976.

Barratt Jr. High	Debra L. Purnell
Bartlett Jr. High	Guy F. Anderson Gerald D. David Theresa A. Lee Louis G. DiTullio
Beeber Jr. High	Geraldine Brown Ernest J. Cooney Joseph Adams
Penn Treaty Jr. High	Dawn P. Gage Guillermo Ocasio
Stoddart-Fleisher Jr. High	Tammy Rayford Carol Williams
Sulzberger Jr. High	Ervick T. Daniels Carole A. Phillips
Wanamaker Jr. High	Wayne G. Greene

C. SCHEDULE OF DAILY ACTIVITIES

The following is a daily schedule of the activities of the 1976 Summer Career Workshop Program.

1st WEEK

1. July 6, 1976

   a. 8:15 A.M. - All students will report promptly to Room 304-Stauffer Hall (Southeast Corner Broad & Columbia Ave.) for initial meeting.

   b. 8:30 A.M. - 12:30 P.M. - Daily session on General Engineering information and Mechanical Engineering Technology area.

   c. 12:30 P.M. - Lunch - Temple University - Student Activities Center

   d. 1:30 P.M. - Dismissal to go home or Physical Education Activities.

2. July 7 & 8

   a. 8:30 A.M. - 12:30 P.M. - Report to Room 404, Stauffer Hall. Daily sessions on Mechanical Engineering Technology.

   b. 12:30 P.M. - Lunch - Temple University - Student Activities Center

   c. 1:30 P.M. - Dismissal to go home or Physical Education Activities

2nd WEEK

1. July 12, 13, 14

   a. 8:30 A.M. - 12:30 P.M. - All students must report to Room 507, Stauffer Hall, Daily sessions in Electrical Engineering Technology.

   b. 12:30 P.M. - Lunch - Temple University - Student Activities Center

   c. 1:30 P.M. - Dismissal to go home or Physical Education Activity

2. July 15 -

   a. 8:30 A.M. - Report to Room 404, Stauffer Hall. Tour of Sperry - Rand.

   b. 12:30 P.M. - Lunch - Temple University - Student Activities Center

   c. 1:30 P.M. - Dismissal to go home or Physical Education Activity

3rd WEEK

1. July 19, 20, 21 -

   a. 8:30 A.M. - 12:30 P.M. - Report to Room 404, Stauffer Hall. Daily sessions on Civil Engineering/Construction Technology.

   b. 12:30 P.M. - Lunch at Temple University - Student Activities Center

   c. 1:30 P.M. - Dismissal to go home or Physical Education Activities.

2. July 22 -

   a. 8:30 A.M. - Report to Room 404, Stauffer Hall. Tour of Philadelphia International Airport.

   b. 12:30 P.M. - Lunch at Temple University - Student Activities Center

   c. 1:30 P.M. - Dismissal to go home or Physical Education Activity

4th WEEK

1. July 26, 27, 28

   a. 8:30 A.M. - 12:30 P.M. - Report to Room 404, Stauffer Hall or other room to be announced. Daily sessions on Mechanical Engineering Technology.

   b. 12:30 P.M. - Lunch at Temple University

   c. 1:30 P.M. - Dismissal to go home or Physical Education Activity

2. July 29

   a. 8:30 A.M. - 12:30 P.M. - Report to Room 404, Stauffer Hall. Tour of Second Sun Nuclear Energy Museum.

   b. 12:30 P.M. - Lunch at Second Sun

   c. 1:30 P.M. - Dismissal to go home or Physical Education Activity

5th WEEK

1. August 2, 3, 4

a. 8:30 A.M. - 12:30 P.M. - Report to Room 507, Stauffer Hall
Daily Sessions in Electrical Engineering Technology.

b. 12:30 P.M. - Lunch at Temple University - Student Activities Center

c. 1:30 P.M. - Dismissal to go home or Physical Education Activity

2. August 5

a. 8:30 A.M. - 12:30 P.M. - Report to Room 404, Stauffer Hall. Tour of Emergency Care Research Institute.

b. 12:30 P.M. - Lunch at Temple University - Student Activities Center

c. 1:30 P.M. - Dismissal to go home or Physical Education Activity

6th WEEK

1. August 9, 10, 11

a. 8:30 A.M. - 12:30 P.M. - Report to Room 404, Stauffer Hall. Tour of Ambler Water Treatment Plant.

b. 12 :30 P.M. - Lunch at Temple University - Student Activities Center

c. 2:00 P.M. - 3:30 P.M. - Report to Stauffer Hall, Room 404. Student evaluation and follow-up instructions.

d. 3:30 P.M. - Dismissal.

D. WORKSHOP SESSIONS

1. MECHANICAL ENGINEERING TECHNOLOGY SESSIONS

The field of mechanical engineering and its challenges relating to areas of transportation, power and communication were explored. Discussions were held regarding Buckminster Fuller's ideas of the future as presented in the July, 1976 issue of National Geographic. Additional food for thought was presented from another article from the same issue of National Geographic regarding space stations from the article entitled "The Next Frontier."

Two motion pictures, "It's Your Turn to Steer" and "To Communicate" were shown to reinforce the lecture. These films presented technologies impact on our lives and strove to motivate the viewer to participate in trying to find solutions to such problem's as waste and pollution.

The students were given a cursory trip through the power, fluid and mechanical labs to whet their appetites for the demonstrations and lab work which were to follow. Most of the students observed equipment which they had never seen before.

(a.) Drawing session: Students were introduced to drafting equipment (nomenclature, purpose, use): measurement of angles and lines; types of pencils and lines used in drafting; and lettering.

(b.) The object of this session was to give the students an understanding of energy and power. Basic terms such as BTU and horsepower were explained. Fuels and their conversion were broadly discussed. Current energy sources and their associated problems were examined. Potential new sources of energy was a topic of lively discussion for the students.

(c.) "It's Your Turn" - the introductory film of the series was presented and discussed - stimulating the students to consider: "What Can I Do?"

(d.) In presenting the lecture on "Engineering - A Future - A Profession" the various catagories of engineering were explored namely: systems, sales, and operating engineers. A brief description of each engineer's responsibilities and his educational background requirements was given. Much student interest was shown and some students even expressed their choice of category in which they would like to serve. An effort was made to have the students add new words to their vocabulary. This session closed with a discussion of the day's program.

(e.) Numerical Control: History of mechanization, automation and automatic control theory as they relate to manufacturing were presented. Machine shop operations - metal removal through basic machine methods were discussed. Interest in the use of computers to produce the six-track tape that is fed into the machines was generated.

(f.) Power Lab Demonstration: The PV diagrams for the Otto and Diesel cycles were presented and their organization was related more to the scientific or physics related branch of engineering than to the design phase. The basic engine designs were discussed. The student related especially well to the functional horsepower four cycle gasoline engines because of its transparent cylinder. Both engines were run and horsepower determinations were made as well as fuel burning characteristics observed.

(g.) Guest Speakers - Hudson Engineers: The students were fascinated by the pictures and lecture presented by the men from this consulting firm. The proposed off-shore ports was especially interesting. A brief presentation was also made regarding transportation equipment and bridges.

(g.) Mechanical Lab Demonstration: Much of the equipment in the Fluids Lab and in the Mechanical Lab were demonstrated with considerable hands-on experience for the students. They operated the controls, opened and closed valves, made weighings and readings, calculated data and results and gained familiarity with fluid experimentation and applications, mechanical testing of steel and other metals and hardness determinations through three types of testers.

(i.) Fluid Lab Demonstration: Demonstrations relating to fluid statics and dynamics were presented. A pressure measuring device was used to calibrate a Bourbon guage. A demonstration using the Venturi meter was also presented and discussions involving its use were held. The equipment was used by the students and they expressed much interest in the experiments.

(j.) Temple Libraries: The students were presented the workings and intricacies of the College of Engineering Technology Library and Paley Library through guided tours by the librarians. Much interest was shown in the use of the microfiche in locating information.

(k.) Guest Speakers - RCA: Two excellent presentations were made by a mechanical and an electrical engineer concerning radars used in the space program namely: those designed and built for the lunar trips and those proposed for the space shuttle program. Phased array radars were discussed followed by a role playing between the engineers regarding the redesign of a feed horn in order to make it weigh less. Other subjects related to patents and renumeration of engineers were presented.

(l.) Film Strip - Mechanical Engineering: This film strip describes the opportunities and fields open to the mechanical engineering graduate. It stresses the diversification of the profession and expounds the challenges. It also illustrates the relationships of the mechanical engineering technologists with other types of technology.

(m.) Mechanical Drawing: During this second drawing session the students applied the principles learned in session one to practice with use of instruments, duplicating geometric figures with parallel rule, triangles, scale and protractor.

(n.) "Field Trip to "Second Sun": The trip to the nuclear presentation aboard the ship "Second Sun" was the high point of the two weeks with the Mechanical Department. An appropriate film relating to our Bicentennial Year was seen showing our progress especially regarding modes of power which were used. One other of the many demonstrations and slides was the slides showing the proposed floating nuclear power stations.

A more detailed account of what was seen and demonstrated is covered by the brochures published by the Public Service Electric and Gas Co. of New Jersey.

2. ELECTRICAL ENGINEERING TECHNOLOGY SESSIONS

(a.) A lecture demonstration format was employed to acquaint these students to the multiphasic aspects of the discipline of electrical engineering technology. In particular, the basic concepts of electrical circuit theory and electrical energy flow were illustrated through the development of the circuit concept of the first week's meetings.

(b.) Basic Electricity, Simple Circuits and the Concept of Resistance and, Alternating Current Circuits along with the Concepts of Inductance and Capacitance were presented through lectures which were supplemented by hands-on laboratory experimentation and in depth participation by the experimental group student body. These laboratory experiments included: Threshold of feeling demonstrations, electrical safety and energy dissipatio demonstrations, an Ohms Law verification, a quiz game individual project experiment, a parallel circuit experiment, principles of a cathode ray oscilloscope, an inductance and transformer experiment, and an experiment concerning capacitors and inductors in an alternating current system.

(c.) The first week's activity was culminated by an educational and stimulating field trip to the Univac Corporation wherein the lectures and demonstrations in the classroom were brought to a living perspective by a thorough tour of the engineering and manufacturing facilities of this international computer corporation.

(d.) The sessions of the second week's presentation were directed toward acquainting the experimental group with modern semiconductor electronic devices and the use of these devices in modern day electronic systems. In particular the group studied basic amplifiers and built these as laboratory projects as part of radios, transmitters, burglar alarms, Morse Code oscillators and other meaningful projects that we included as experiments in an Electronic Experimenter's Kit. In addition, a special session on electronic computers was presented such that the students could appreciate the miniaturization and compactness of the modern electronic elements as opposed to their vacuum tube ancestors. A tour of the Temple University Computer Center was conducted and the students were intorduced to computer programming and were tested in accordance with their skills in engaging the computer in games. The students were instrucyed in writing an elementary computer program and enjoyed the experience of using a teletype writer in submitting the program and observing the computer to solve the problem and print the results.

(e.) Biomedical Engineering Technology was covered through a stimulating lecture hands-on experiment in which the students performed a physiology experiment on the cardiac function of a frog. The animal was placed under anesthesia and the students monitored the electro-cardiogram of the frog under conditions of varying temperature. The principles of galvanic skin resistance, pulmonary function, nervous system conduction were discussed and illustrated by demonstrations.

(f.) The second week was completed by a rewarding field trip to the Emergency Care Research Institute, in Philadelphia, a unique corporation which tests biomedical engineering instruments, materials, and devices for hospitals and the medical profession. There the students visualized the true interaction of the engineering profession as an aid to the practice of modern medicine.

3. CIVIL ENGINEERING TECHNOLOGY SESSIONS

(a.) The civil engineering portion of the National Science Foundation Career Workshop for the Summer of 1976 was conducted during the weeks of July 19th and August 9th. The first week was devoted to concrete as a construction material. The second week dealt with fundamentals of surveying, environmental engineering principles and physical testing of concrete.

(b.) The first week began with a slide presentation which showed the uses of concrete as a structural material. The slides showed the forming of cast-in-place members, precast members, prestressed members, and special surface contouring with concrete. Next, the students were introduced to the basic ingredients of concrete, namely: portland cement, water, sand, gravel, and air.

(c.) Properties of the sand and gravel, which were necessary to design a concrete mixture, were measured in the laboratory by the students. The students performed a sieve analysis test on the sand and gravel to determine the fineness modulus and maximum size of the aggregate. They also performed specific gravity tests and absorption tests on the aggregate. The results of the tests were summarized and the resulting values were used by the students to determine the weights of the ingredients to be used in a concrete mixture.

(d.) At the next class meeting the students went into the concrete laboratory and prepared their concrete mixture using the weights of materials they had previously calculated. A one cubic foot batch of concrete was prepared and placed into 6 inch diameter standard concrete molds. The molds were cured for 21 days at which time they were crushed in the testing machine. The compressive strengths showed very small variations for each of the cylinders in a test sample. The average compressive strength of a sample also was in close agreement with the expected design strength.

(e.) The surveying fundamentals were developed through field problems. Stations were set up on the campus and the students made angle measurements and distance measurements with the transit and level. At the transit station the students measured horizontal angles, vertical angles and horizontal distances using a stadia rod. At the level station the students measured vertical distances on a rod from which differences in elevations were determined.

(f.) The data compiled by the students was summarized by the instructor. The measurements were then applied to various triangular configurations known and unknown distances and angles were studied by the students and the unknowns were obtained by substituting into appropriate trigonometric relationships. Thus, measured angles and distances were transformed through mathematical expressions to meaningful measurements that could be observed but not easily measured in the field.

(g.) The students were taken on two tours, one to the Philadelphia International Airport and the other to the Ambler Sewage Treatment Plant. At the Philadelphia Airpot, they saw construction of garages and buildings using precast concrete members and the placing of concrete for a new 10,000 feet runway. At the Ambler Sewage Treatment Plant, the students saw the sewage digestion process and a chemical analysis of the effluent which was done in a chemical laboratory at the site.

D. FOLLOW-UP SESSIONS FOR 1976 WORKSHOP GROUP

Two groups were scheduled for follow-up programs in February and April of 1977. These sessions were designed to maintain a close relationship with the students who completed the summer career workshop. They also provided certain laboratory experiences to keep them motivated and interested in the field of engineering.

(a.) Follow-up Session - February 5, 1977

The follow-up session scheduled for the two groups on February 5, 1977 was cancelled due to the energy crisis which developed in this area at thie time. The College of Engineering Technology was closed for over a week since it was a gas fired building. All gas fired buildings were shut down during this period. To save energy, the College of Engineering Technology was closed on the weekends until the warmer weather prevailed.

(b.) Follow-up Session - April 16, 1977

The follow-up session scheduled for the two groups in April was held on April 16, 1977. The sessions were planned to have the students conduct hands-on laboratory experiments in civil and mechanical engineering concepts. Of the thirty students involved, only fourteen actually attended. The large number of students absent was a result of the SEPTA transportation strike in which no public transportation was available. In view of this situation, it was felt that the turn out for this session was good in spite of the hardships caused by the transportation strike.

(c.) Follow-up Session - February 17, 1979

This was a follow-up session for both NSF II & III Groups. The material to be covered was concerned with laboratory equipment and procedures utilized in Mechanical Engineering. In the first part of the session, the students were instructed on simple measuring techniques. They were then given the opportunity to practice individually using micrometers in which they took and recorded readings on furnished precision parts.

The second half of the session was devoted to a demonstration of the engineering function of tensile strength testing. Different specimens were tested using the 60,000 lb. Tinius Olsen tester using a standard ½ inch round specimen. Different properties were investigated. These included tensile strength, elongation, reduction of area, yield strength, and fracture point.

(d.) Follow-up Session - April 21, 1979

Follow-up sessions were conducted on April 21, 1979 for NSF Groups II & III.

The students in NSF Group II who were scheduled to graduate from high school in June 1979 met with Theodore P. Vassallo. This session was devoted to the college plans of the individual students. Updated information on the program of studies and the colleges the students applied to and accepted were noted. Letters of recommendations to college admissions officers and financial aid information was discussed. Appointments were made for three students who desired to discuss in private specific problems concerning their admission to college.

Also considered in this session was the request of a few in NSF II who desired some summer employment. While we are not obligated to obtain jobs for this graduating group, we mentioned that every effort would be made to assist them obtain jobs for the summer.

Students in NSF Group III met with F. S. Woerth, our Coordinator of Industrial Relations. Preliminary information and instructions were covered on job placement for this summer. Several students were given specific information about jobs which were already available. The others were told that definite arrangements were not completed at the time, but that we would be in contact with them. This was the case with the jobs with the City of Philadelphia and the Philadelphia Naval Base. The prospects to place the students in NSF III group appeared to be excellent at the time. Attendance at both these sessions was excellent. Students were either present at the group meeting or were personally contacted.

The civil engineering and mechanical engineering departments held a combined program for the NSF students on Saturday, April 16, 1977.

In the first part of the program, two films were shown which illustrated to the students the mechanical behavior of construction materials and the behavior of structural members under various loading conditions. After the films were shown, Dr. Stone lectured to the students about moment of inertia of cross sectional areas and showed how this property of the area was computed for several different area configurations.

In the second part of the program, the students were taken to the structural laboratory where pre-assembled wooden columns of various lengths and cross-section configurations were loaded to failure. Before the load was applied, Dr. Stone lead the students through a theoretical analysis as to what the failure load should be. The analysis incorporated the values of the moments of inertia which were computed in the first part of the program. The loads measured by the testing machine correlated well with the theoretical predictions.

F. HIGH SCHOOL PARTICIPATION (Phase II)

Mr. Benjamin Dudley, of the Mathematics Office, School District of Philadelphia visited each student in this group at their local high schools during the academic year. Mr. Dudley has made one visit at this time and has reported no serious problems. He reported no serious problems with the students in NSF Groups I & II.

G. SUMMER EXPERIENCE POSITIONS FOR NSF GROUP II (Summer 1977)

All of the students in the 1976 Career Workshop were assigned to various positions with industry, government agencies, or on campus positions. Some jobs did not provide any compensation but they did supply carfare and lunch money to each student involved.

As a whole, this 1976 workshop group did not appear to be as strong academically as the first group. This was apparent in their testing results and in their school work during the Academic Year 1976-77. Two students did not achieve satisfactorily and were required to attend Summer School to make up some deficiencies.

1. SUMMER WORK EXPERIENCE NSF GROUP II (1977)

The following is a list of the students and the organizations to which they were assigned for their 1977 summer job experiences.

NAME OF STUDENT	SPONSORING ORGANIZATION
1. Michelle Crump	Summer Leave of Absence
2. Francheska Hamilton	Summer Leave of Absence
3. Michael Jennings	College of Engineering Tech - Engrg. Dept.
4. Aretha Johnson	City of Phila. - Engrg. Dept.
5. Ronald Johnson	Summer Leave of Absence
6. Brenda Lee	Temple University - Chemistry Dept.
7. Nyoka McCrimmon	Temple University - Physics Dept.
8. Crayerling McGhee	City of Phila. - Engrg. Dept.
9. April Myers	Temple University - Physics Dept.
10. Leah Oles	Summer Leave of Absence
11. Ruben Rios	Medical Leave of Absence
12. Gail Russell	Summer Leave of Absence
13. Thelodis Strickland	Philadelphia Electric Company
14. Anthony Thomas	City of Phila. - Engrg. Dept.
15. Larry Thomas	College of Engineering Tech - Engrg. Dept.

Michelle Crump took a summer leave of absence to obtain a paying job because of family hardships. Francheska Hamilton could not participate because of a baby sitter problem. Ronald Johnson went to Alabama to visit with his Grandmother. Ruben Rios took a medical leave of absence.

On October 1, 1977 Mr. F. Stanton Woerth had a critique session with this group in their summer work experiences.

While none of these students in this group had jobs which paid a stipend, they felt that their experience was important to them in developing a better understanding of engineering in action.

Some of these students received carfare and lunch money from a special grant provided by the IBM Corporation.

2. SUMMER WORK EXPERIENCE NSF GROUP II (Summer 1978)

NAME OF STUDENT	SPONSORING ORGANIZATION
1. Michelle Crump	IBM Corporation
2. Francheska Hamilton	Temple University
3. Michael Jennings	City of Philadelphia - Streets Dept.
4. Aretha Johnson	Rohm & Haas Corporation
5. Ronald Johnson	Philadelphia Naval Base - Engrg. Dept.
6. Brenda Lee	City of Philadelphia - Streets Dept.
7. Nyoka McCrimmon	Philadelphia Naval Base - Switch Board
8. Grayerling McGhee	City of Philadelphia - Streets Dept.
9. April Myers	IBM Corporation
10. Leah Oles	Summer Leave of Absence
11. Ruben Rios	City of Philadelphia - Streets Dept.
12. Gail Russell	Recreation Center - Counselor
13. Thelodis Strickland	Philadelphia Naval Base - Engrg. Dept.
14. Anthony Thomas	City of Phila. - Streets Dept.
15. Larry Thomas	City of Philadelphia - Streets Dept.

3. SUMMER WORK EXPERIENCE NSF GROUP II (Summer 1979)

NAME OF STUDENT	SPONSORING ORGANIZATION
1. Michelle Crump	ACT 101 Summer program - Drexel U.
2. Francheska Hamilton	Local Garment Manufacturing Co.
3. Michael Jennings	No Request for Employment
4. Aretha Johnson	Pre-College Program - West Chester
5. Ronald Johnson	Military Service
6. Brenda Lee	IRS
7. Nyoka McCrimmon	Philadelphia Naval Base
8. Grayerling McGhee	No request for employment
9. April Myers	Summer School & Part Time Job - U.of Pa.
10. Leah Oles	Summer Prep Program
11. Ruben Rios	No Assignment
12. Gail Russell	Pre-College Program - West Chester
13. Thelodis Strickland	Summer Prep Program
14. Anthony Thomas	Temple Mini-Workshop
15. Larry Thomas	Philadelphia Naval Base

H. COLLEGE PLANS

1. SUMMARY OF NSF II COLLEGE PLANS (EXPERIMENTAL GROUP)

	NAME	PROGRAM	COLLEGE
1.	Michelle Crump	Engineering	Drexel University
2.	Brenda Lee	Engineering	Penn State
3.	April Myers	Engineering	Temple University
4.	Gail Russell	Education(Computer)	West Chester State
5.	Thelodis Strickland	Engineering	Temple University
6.	Larry Thomas	Engineering	Temple University
7.	Ruben Rios	Engineering	Phila. Community College
8.	Grayerling McGhee	Engineering	Phila. Community College
9.	Nyoka McCrimmon	Engineering	Phila. Community College
10.	Aretha Johnson	Education(Math Teacher)	West Chester State
11.	Leah Oles	Education (Undeclared)	Ind. - University of Penna.
12.	Michael Jennings	Engineering	Next Year (Work)
13.	Anthony Thomas	Engineering	Next Year (Work)
14.	Francheska Hamilton	Engineering	Next Year (Married) (Work)
15.	Ronald Johnson	Engineering	Military Service - First

2. SUMMARY OF NSF COLLEGE PLANS (CONTROL GROUP)

	NAME	PROGRAM	COLLEGE
1.	Joseph Adams	Engineering	J.C. Smith University
2.	Debra Purnell	Engineering Technician	Temple University
3.	Tammy Rayford	Nursing	Community College - First
4.	Wayne G. Greene	Business Administration	Morgan State
5.	Carole A. Phillips	Computer Science	N. Carolina Agr. & Tech.
6.	Dawn P. Gage	Engineering	Next Year a possibility
7.	Guy F. Anderson	Work	Married
8.	Theresa A. Lee	Work	No Plans
9.	Guillermo Ocasio	Hairdressing	No Decision
10.	Louis Ditullio	Work	No Plans
11.	Geraldine Brown	Work	No Plans
12.	Ernest J. Coney	Military Service	No Plans
13.	Gerald D. Davis	Will not graduate H.S.	this year
14.	Carol Williams	Will not graduate H.S.	this year
15.	Ervick T. Daniels	Dropped out of school	

Of the 15 students in the Experimental Group, 12 planned to pursue an engineering career within three years. Six students enrolled in an engineering school in the Fall 1979. Three registered in a Community College 2 year program before matriculating in an engineering school. Three others worked one year and then began their engineering schooling in the Fall of 1980. One student planed to enter the military service for approximately three years and then go on to an engineering school on terminating his military experience. Three others planned to matriculate in a College of Education. Of these, one enrolled in mathematics education a second in computer technology, and the third was undeclared for the first academic year.

Overall, 14 of the 15 students in the experimental group planned to pursue some type of higher education by the Fall of 1980.

Of the students participating in the NSF II Control Group only one student entered an engineering school and one in the Fall of 1980. Three other students enrolled in programs of higher education. These include Nursing, Business Administration, and Computer Science. A fourth student pursued a technicians program in one of the local schools and still another went to a hairdressing school.

Four students planned to seek employment and had no specific plans for future education. One student entered the military service while two others, who did not graduate from high school were uncertain about their future educational plans. In addition one student dropped out of school during the academic year.

NSF GROUP III

A. SELECTION OF STUDENTS

Of the 65 student who applied for the 1977 Summer Workshop program, 52 were tested on March 2, 1977. The testing program was supervised by Dr. James P. Smith Jr., our Counseling Psychologist.

Of the 52 students who were tested, 30 students were selected who performed successfully on the Differential Aptitude Test based on the following criteria.

Of the nine subtests included on the DAT, six subtests have the best predictive validity with respect to successful completion of all engineering programs: Verbal Reasoning, Numerical Ability; Verbal Reasoning and Numerical Ability (combined score), Abstract Reasoning, Mechanical Reasoning, and Space Relations. Any student who scored below the 50th percentile in four or more of the six subtests was not considered to have successfully completed the DAT.

Of the top 30 students, 15 were randomly selected to be in the Experimental Group and 15 in the Control Group by the Management Committee at the meeting on April 20, 1977.

The following is a list of the students selected in the Experimental Group for the 1977 Summer Career Workshop.

Masterman Jr. High	Kimberly Ardley
	Stanley Baines
	Tracy Collins
	Sandra Johns
	Sabrina Lewis
	Glenn O. Wilson
Shaw Jr. High	Cleveland A. Chavis
Sayre Jr. High	Patricia M. Gentry
	Helen P. Gray
	Herman E. Hall
	Spencer E. Harrison
Sulzberger Jr. High	Carla M. Johnson
University City High	Sinoba McKelvey
	Marc A. Turner
Bartram High	Zina Nelson

The following students were selected to participate in the Control Group.

Bartram High	Charles E. Mosby
Masterman Jr. High	Gina L. Henderson
	Amonja Jackson
	Kerby C. Hunger
	Blanche Phillips
	Elizabeth Sanders
	Sharon L. Shepherd
Sayre Jr. High	Clarence G. Agnew
	George Perkins
	Randall D. Sellers
	Tarez E. Walden
Sulzberger Jr. High	Bobbie V. Overton
University City High	Damon Gaskins
	Belinda Howard
	Geraldine Supplee

B. PARENT STUDENT ORIENTATION

On May 21, 1977 a parent student orientation meeting was scheduled in the College of Engineering Technology. Information concerning the activities to be covered in the summer workshop was discussed with the parents and students attending.

A slide presentation of the previous summer workshop was shown which revealed students in various activities and field trips. Rules and regulations concerning the workshop were mentioned and many questions were answered.

C. SCHEDULE OF DAILY ACTIVITIES

The following is a schedule of the daily activities of the National Science Foundation Summer Career Workshop held at the College of Engineering Technology, Temple University from July 5 to August 11, 1977.

1st WEEK

1. July 5, 1976 -

   a. 8:15 A.M. - All students will report promptly to Room 304, Stauffer Hall (Southeast Corner Broad & Columbia Ave.) for initial meeting.

   b. 8:30 A.M. - 12:30 P.M. - Daily session on General Engineering information and Mechanical Engineering Technology area. Room to be assigned.

   c. 12:30 P.M. - Lunch - at Temple University (Student Activities Center)

   d. 1:30 P.M. - Dismissal to go home.

2. July 6 & 7

   a. 8:30 A.M. - 12:30 P.M. - Report to Room 404, Stauffer Hall or other rooms to be announced. Daily sessions on Mechanical Engineering Technology.

   b. 12:30 P.M. - Lunch - Temple University (Student Activities Center)

   c. 1:30 P.M. - Dismissal to go home.

2nd WEEK

1. July 11, 12, 13

   a. 8:30 A.M. - 12:30 P.M. - All students report to Room 507, Stauffer Hall. Daily sessions in Electrical Engineering Technology.

   b. 12:30 P.M. - Lunch - Temple University (Student Activities Center)

   c. 1:30 P.M. - Dismissal to go home.

2. July 14

   a. 8:30 A.M. - Report to Room 404, Stauffer Hall. Tour of industrial site to be announced.

   b. 12:30 P.M. - Lunch - Temple University (SAC)

   c. 1:30 P.M. - Dismissal to go home.

3rd WEEK

1. July 18, 19, 20

   a. 8:30 A.M. - 12:30 P.M. - Report to Room 404, Stauffer Hall or other room to be announced. Daily sessions on Civil Engineering/ Construction Technology.

   b. 12:30 P.M. - Lunch at Temple University (SAC)

2. July 21

   a. 8:30 A.M. - Report to Room 404, Stauffer Hall. Tour of industrial site to be announced.

   b. 12:30 P.M. - Lunch at Temple University

   c. 1:30 P.M. - Dismissal to go home.

4th WEEK

1. July 25, 26, 27

   a. 8:30 A.M. - 12:30 P.M. - Report to Room 404, Stauffer Hall or other room to be announced. Daily sessions on Mechanical Engineering Technology.

   b. 12:30 P.M. - Lunch at Temple University

   c. 1:30 P.M. - Dismissal to go home.

2. July 28

   a. 8:30 A.M. - 12:30 P.M. - Report to Room 404, Stauffer Hall. Tour of industrial site to be announced.

   b. 12:30 P.M. - Lunch at Temple University

   c. 1:30 P.M. - Dismissal to go home.

5th WEEK

1. August 1, 2, 3

   a. 8:30 A.M. - 12:30 P.M. - Report to Room 507, Stauffer Hall or other room to be announced. Daily sessions in Electrical Engineering Technology

   b. 12:30 P.M. - Lunch at Temple University

   c. 1:30 P.M. - Dismissal to go home

2. August 4

   a. 8:30 A.M. - 12:30 P.M. - Report to Room 404, Stauffer Hall. Tour of industrial site to be announced.

   b. 12:30 P.M. - Lunch at Temple University

   c. 1:30 P.M. - Dismissal to go home

6th WEEK

1. August 8, 9, 10

   a. 8:30 A.M. - 12:30 P.M. - Report to Room 404, Stauffer Hall or other rooms to be announced. Daily sessions in Civil Engineering/Construction Technology.

   b. 12:30 P.M. - Lunch at Temple University

   c. 1:30 P.M. - Dismissal to go home.

2. August 11

   a. 8:30 A.M. - 12:30 P.M. - Report to Room 404, Stauffer Hall. Tour of industrial site to be announced.

   b. 12:30 P.M. - Lunch at Temple University

   c. 2:00 P.M. - 3:30 P.M. - Report to Stauffer Hall, Room 404. Student evaluations and follow-up instructions.

   d. 3:30 P.M. - Dismissal to go home.

D. WORKSHOP SESSIONS

The following is a detailed description of the activities conducted during the 1977 career workshop sessions.

1. MECHANICAL ENGINEERING TECHNOLOGY SESSIONS

It was the object of our department to not only introduce the students to the engineering field, but to acquaint them with the major problems of the times and establish for them the relationship of technology with these problems. Of course, two of these problems are energy and the environment. Our program was therefore primarily based about these.

The first class session was devoted to a talk by Professor Ridenour, guest lecturer, who discussed solar energy. Being a timely topic, it aroused the student's interest and set the theme for sessions to follow.

Throughout the two week period we displayed a series of films entitltled "It's Your Turn". They explained how the younger generation must face out technological problems in energy, ecology, space and communications. All films were well received by the students.

In addition to our regular faculty, we had four guest lecturers from industry. They were Edward Hendler and Frank Slovic of Hudson Engineers who spoke on off shore ports. Robert Mason and Earl Dixon of RCA discussed communications during the moon mission. Steven Williamson of ARCO presented a talk about Alaskan oil. And from the Budd Co., Dr. Thomas Ward introduced the students to today's transportation problems and possible solutions for some of them.

Our own faculty also lectured on these topics to some extent and also operated engineering drawing sessions, heat and fluids laboratory sessions plus laboratory sessions where the students tested materials for their physical characteristics.

We took a trip to the "Second Sun". This is a ferry boat which has been corrected to a floating exhibit devoted to nuclear energy.

It is the feeling of our faculty that we meet the objectives of the program for these first year students.

2. ELECTRICAL ENGINEERING TECHNOLOGY SESSIONS

A lecture demonstration format was employed to acquaint these students to the multiphasic aspects of the discipline of electrical engineering technology. In particular, the basic concepts of electrical circuit theory and electrical energy flow were illustrated through the development of the circuit concept in the first weeks' meetings.

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Basic Electricity, Simple Circuits and the Concept of Resistance and, Alternating Current Circuits along with the Concepts of Inductance and Capacitance were presented through lectures which were supplemented by hands-on laboratory experimentation and in depth participation by the experimental group study body. These laboratory experiments included: Threshold of feeling demonstrations, electrical safety, electric power generation, and energy dissipation demonstrations, an Ohms Law verification, a quiz game individual project experiment, a parallel circuit experiment, principles of a cathode ray oscilloscope, and inductance and transformer experiment, and an experiment concerning capacitors and inductors in an alternating current system.

The first week's activity was culminated by an educational and stimulating field trip to the Univac Corporation where-in the lectures and demonstrations in the classroom were brought to a living perspective by a thorough tour and film presentation of the engineering and manufacturing facilities of this international computer corporation.

The sessions of the second week's presentation were directed toward acquainting the eexperimental group with modern semi-conductor electronic devices and the use of these devices in modern day electronic systems. In particular the group studied basic amplifiers and built these as laboratory projects as part of radios, transmitters, burglar alarms, Morse Code oscillators and other meaningful projects that were included as experiments in an Electronic Experimenter's Kit. In addition, a special session on electronic computers was presented such that the students could appreciate the miniaturization and compactness of the modern electronic elements as opposed to their vacuum tube ancestors. A tour of the Temple University Computer Center was conducted and the students were introduced to computer programming and were tested in accordance with their skills in engaging the computer in games. The students were instructed in writing an elementary computer program and enjoyed the experience of using a teletype writer in submitting the program and observing the computer to solve the problem and print the results.

Biomedical Engineering Technology was covered through a stimulating lecture hands-on experiment in which the students performed a physiology experiment on the cardiac function of a frog. The animal was placed under anesthesia and the students monitored the electro-cardiogram of the frog under conditions of varying temperature. The principles of galvanic skin resistance pulmonary function, nervous system conduction were discussed and illustrated by demonstrations.

The second week was completed by a rewarding field trip to the Emergency Care Research Institute, Blue Bell, Pa., a unique corporation which tests biomedical engineering instruments, materials, and devices for hospitals and the medical profession. There the students visualized the true interaction of the engineering profession as an aid to the practice of modern medicine.

3. CIVIL ENGINEERING TECHNOLOGY SESSIONS

The civil engineering portion of the National Science Foundation Career Workshop for the Summer of 1977 was conducted during the weeks of July 18th and August 8th, 1977. The first week was devoted to concrete as a construction material. The second week dealt with fundamentals of surveying, environmental engineering principles and physical testing of concrete.

The first week began with a slide presentation which showed the uses of concrete as a structural material. The slides showed the forming of cast-in place members, precast members, prestressed members, and special surface contouring with concrete. Next, the students were introduced to the basic ingredients of concrete, namely: portland cement, water, sand, gravel, and air.

Properties of the sand and gravel, which were necessary to design a concrete mixture, were measured in the laboratory by the students. The students performed a sieve analysis test on the sand and gravel to determine the fineness modulus and maximum size of the aggregate. They also performed specific gravity tests and absorption tests on the aggregate. The results of the tests were summarized and the resulting values were used by the students to determine the weights of the ingredients to be used in a concrete mixture.

At the last class meeting of the first week the students went to the concrete laboratory and prepared their concrete mixture using the weights of materials which they had previously calculated. A one cubic foot batch of concrete was prepared and placed into 6 inch diameter standard concrete molds. The molds were cured for 21 days at which time they were crushed in the testing machine. The compressive strengths showed very small variations for each of the cylinders in a test sample. The average compressive strength of a sample also was in close agreement with the expected design strength.

The surveying fundamentals were developed through field problems. Stations were set up on the campus and the students made angle measurements and distance measurements with the transit and level. At the transit station the students measured horizontal angles, vertical angles and horizontal distances using a stadia rod. At the level station the students measured vertical distances on a rod from which differences in elevations were determined.

The field data were summarized by the instructor and the measurements where applied to various traingular configurations. Known and unknown distances and angles were studied by the students and the unknowns were obtained by substituting information on appropriate trigonometric relationship. The measured angles and distances were transformed through mathematical expressions to meaningful measurements that the students could observe but not readily measured in the field.

The students were taken on two tours, one to the Philadelphia Internal Airport and the other to the Air Management Services of the Philadelphia Department of Public Health. At the Philadelphia International Airport the students saw the conceptual development of an air terminal facility and various structural systems which were used to build garages, ramps and terminal buildings.

At the Air Management Services facility the students were given a lecture by the manager of the facility about various types of the pollutants and how their concentrations were measured. After the lecture the students toured the laboratories.

E. FOLLOW-UP SESSIONS OF 1977 CAREER WORKSHOP GROUP

1. Follow-up Session - December 17, 1977

On Saturday, December 17, 1977 the Civil Engineering Department presented a lecture about predicting the structural behavior of a column to NSF Group 3. The presentation showed the basic formula for predicting the load carrying capacity of a slender column. The modulus of elasticity, which is one factor required in the formula, was discussed and a film was shown about how the modulus of elasticity is measured. Further discussion was given about the cross sectional property of the column such as its area and rectangular moment of inertia. Wooden columns with various cross-sectional configurations were measured and properties of the cross section were determined. From the computed information predictions as to the load the column could hold before failure were calculated. The columns were then put into a testing machine in the structural laboratory and loaded to failure. The resulting failure loads agreed reasonably well with the calculated values except for the box cross section in which the glue failed causing the pieces of the column to become thin slender columns which buckled at a much lower failure load than that predicted for the composite box section.

2. Follow-up Session - February 18, 1978

On this date our NSF 1 group covered concepts in Electrical Engineering and NSF II group was involved in a Civil Engineering Session. NSF III group was involved in a Mechanical Engineering Session.

Attendance was good for all the sections scheduled in spite of inclement weather.

a. NSF I - Electrical Engineering Session

A learning experience concerning electronic circuits of two types was realized by a magnetic circuit related to a metal detector and an analog circuit which was part of a citizens band radio.

The students received additional benefit by assembling the equipment for the above circuits and by using basic tools of electrical assembly such as the soldering iron and wire splicers.

Digital logic kits were distributed for home exercises.

b. NSF II - Civil Engineering Session

These sessions were designed to reinforce the students' knowledge of the elastic properties of metallic materials which had been introduced to the students during their summer program in civil engineering.

In this session an aluminium bar was clamped at one end in a table top fixture and the other end was free to deflect, thus forming a cantilever beam. The beam had foil strain gages glued to it with epoxy glue. The foil gaged recorded strain directly by the change in the resistance of the gage as it was alongated or shortened due to the bending of the beam.

The stress was divided by the average strain and a value of "E", the modulus of elasticity, was computed. The "E" value was compared with the value the students' had measured during the summer session. The results showed good correlation.

The students also saw through the strain measurements that when longitudinal dimension of the bar increased the dimension at 90° to the longitudinal dimension decreased, thus creating what is known as the Poisson effect. The ration of the lateral strain to the longitudinal strain is called the Poisson ratio. The value of the ratio, as measured by the students, was compared to a standard value for aluminium. The result showed good correlation.

The students showed interest in knowing that the principles they learned in their electrical engineering sessions were applicable to material testing measurements in civil engineering.

C. NSF III - Mechanical Engineering Session

This session was centered on the use of hand held calculators and introduction to the CDC6400 computer.

Instructions were given on the operation of the hand held calculators. Several applications were then performed in the use of algebra and trigonometry.

An orientation to the CDC6400 computer was given and the students were introduced to the card punching technique. Demonstration programs were then covered and several hands-on "Games" were played. This provided fun for the students while learning a very practical lesson on the use and function of a computer.

3. Follow-up Session - April 29, 1978

The third and last follow-up session for the academic year 1977-78 was held on April 29. The same material included in the February 18th meeting was covered at this time. However, the NSF I group covered material in Civil Engineering, the NSF II group reviewed material in mechanical engineering while the NSF III group was involved with electrical engineering concepts.

Part of Group I session was devoted to problems of financial aid and college admissions. Mr. Nicholas Flocco, Director of Financial Aid at Temple University, spoke to the students about financial aid and he distributed financial aid forms to all.

4. Follow-up Session - December 16, 1978

On December 16, 1978 the second follow-up session was conducted at Temple University. This was a session on Electrical and Biomedical Engineering applications. The students were shown a standard biomedical operating room procedure, in which the biomedical equipment in support of an operation was assembled, debugged, and calibrated. A rat was successfully operated upon to remove a neoplasm of the thyroid gland. He was sewn up by the students and survived the operation in excellent spirits.

5. Follow-up Session - (October 20, 1979)

This follow-up session was conducted by T. P. Vassalo on Saturday, October 20. The session was intended to review the summer employment experiences and to discuss college plans for the future. Attendance was excellent with only two absentees who could not be present.

A review of the comments made by the students concerning their summer employment were most favorable. All of them were pleased and felt that they gained valuable experience, especially those who were in an engineering related setting.

Employers evaluations of the student performance on the job were commendable. A few students were cited for outstanding work. Kimberly Ardley received an award for being a superior employee from the Naval Base in Philadelphia. Glenn Wilson had an excellent evaluation from IBM as did Tracy Collins from General Electric Company. Dr. Tarka the principal investigator of the Temple University mini-workshop rated Helen Gray as a very mature and outstanding worker.

Also discussed at this follow-up session was what students should know about applying to college. The importance of the Scholastic Aptitude Test of the College Entrance Examination Board was noted and what these scores mean to admissions counselors. It was pointed out that these students should investigate several colleges and visit them to get a first hand view of the environment. Many other points of interest were covered and several pertinent questions were discussed.

6. Follow-up Session - (December 8, 1979)

This follow-up session was devoted mainly to financial aid. Mr. Nicholas Flocco, Director of Financial Aid at Temple University spoke to the students on the procedures and regulations regarding financial aid. PCS forms and the PHEAA and BEOG were explained and other sources of financial aid were mentioned.

7. Follow-up Session - February 23, 1980

This follow-up session was conducted jointly by Dr. T. P. Vassallo and Dr. J. E. Tarka.

The first part of the session was devoted to financial aid questions and updated College plans. PHEAA and BEOG questions on procedures and policies were discussed with Dr. T. P. Vassallo. Information concerning college admissions plans and procedures were also reviewed.

The second part of the session was conducted by Dr. J. E. Tarka. He conducted a laboratory hands-on session with the use of the microcomputer and Biomedical equipment used in our Biomedical program.

8. Follow-up Session - June 7, 1980

This follow up session was devoted entirely to final college plans. The students indicated the colleges that they had applied to and the acceptances received. The final choices of each student are noted in the section on College Plans.

F. SUMMER WORK EXPERIENCE

The third and last NSF Group which attended the Summer Career Workshop in 1977 had several students under 16 years of age, tight budgets or insurance problems. However, these students participated in a special mini-workshop this summer at Temple University for the month of July.

1. Summer Work Experience NSF Group III (Summer 1978)

NAME OF STUDENT	SPONSORING ORGANIZATION
1. Kimberly Ardley	City of Philadelphia - Streets Dept.
2. Stanley Baines	Temple University
3. Cleveland Chavis	Philadelphia Electric Co.
4. Tracy Collins	Temple University
5. Patricia Gentry	Temple University
6. Helen Gray	Bell Telephone Company
7. Herman Hall	Leave of Absence - (Virginia)
8. Spencer Harrison	Philadelphia Electric Company
9. Sandra Johns	Temple University
10. Carla Johnson	City of Philadelphia - Streets Dept.
11. Sabrina Lewis	California
12. Sinoba McKelvey	City of Philadelphia - Streets Dept.
13. Zina Nelson	Temple University
14. Marc Turner	Atlantic Richfield
15. Glenn Wilson	Temple University

A special mini-workshop was conducted for those students in the NSF III group who were not placed in industry. Most of these students were under years of age and could not be placed in the various industries contacted because of age restrictions. The special workshop was conducted at Temple University from July 5, 1978 to the 28th under the direction of Dr. John E. Tarka and Professor Albert Dettore. Two weeks were designated for electrical engineering concepts and two weeks on mechanical engineering principles.

The first two weeks was a special project to develop a working model of an energy conversion system which was the creation of a local Black inventor named Isiah Pye. The model was constructed by the NSF students and tested. The system was a complete success. The model performed beyond all expectations according to Dr. Tarka.

Pve's patented process uses energy from under-utilized machinery, converting it into power that can be stored or used to run other machinery. Massive electric generators operate 24 hours a day although their peak demand period may be only 12 hours. Using this process, a small amount of energy from the already running generator is used to power another generator. The power from the second generator can be stored in batteries, converted to steam or used to run machinery.

The second part of the special workshop was devoted to mechanical engineering test and measurement practices. The theory and practice of the micrometer and vernier caliper was demonstrated and experiments conducted on their use. Hardness and tensile strength testing were covered and specimens were tested to determine the engineering characteristics. In addition, the stroboscope and tachometer was reviewed and experiments utilyzing these instruments were performed.

2. SUMMER WORK EXPERIENCE NSF III GROUP (SUMMER 1979)

NAME OF STUDENT	SPONSORING ORGANIZATION
1. Kimberly Ardley	Philadelphia Naval Base
2. Stanley Baines	Carnegie Mellon University
3. Cleveland Chavis	Living with relatives in Texas
4. Tracy Collins	General Electric Company
5. Patricia Gentry	IBM Corporation
6. Helen Gray	Temple Mini-Workshop
7. Herman Hall	Temple Mini-Workshop
8. Spencer Harrison	Recreation Counselor - A.C., N.J.
9. Sandra Johns	Counselor - Neighborhood - Church Program
10. Carla Johnson	Philadelphia Naval Base
11. Sabrina Lewis	Moved to California
12. Sinoba McKelvey	No Assignment
13. Zina Nelson	Temple Mini-Workshop
14. Marc Turner	John Wanamaker Company
15. Glenn Wilson	IBM Corporation

The NSF Group III was the last group which we were responsible to place in summer positions. The chart shows that all but one student was assigned to a position or had made some other plans in lieu of a summer job. This was most encouraging since the summer youth employment picture in the Philadelphia metropolitan area was even more restricted this past summer than in previous years.

C. COLLEGE PLANS

1. Summary of NSF III College Plans (Experimental Group)

	NAME	PROGRAM	COLLEGE
1.	Stanley Baines	Engineering	Carnegie-Mellon
2.	Glenn Wilson	Engineering	Drexel University
3.	Sabrina Lewis	Engineering	MIT
4.	Carla Johnson	Engineering	Temple University
5.	Patricia Gentry	Engineering	Temple University
6.	Kimberly Ardley	Engineering	Middlebury College
7.	Helen Gray	Engineering	Air Force
8.	Marc Turner	Undeclared	Indiana University of Penna.
9.	Spencer Harrison	Music Education	University of Miami
10.	Sinoba McKelvey	Liberal Arts	Mercyhurst
11.	Tracey Collins	Liberal Arts	Penn State
12.	Sandra Johns	Liberal Arts	Dartmouth
13.	Herman Hall	Undeclared	Air Force
14.	Cleveland Chavis	Craftsman	Trade Union School
15.	Zina Stewart	Working	

2. Summary of NSF III College Plans (Control Group)

	NAME	PROGRAM	COLLEGE
1.	Kerby Jones	Engineering	Delaware State
2.	Bobbie Overton	Engineering	Drexel University
3.	Amonja Jackson	Engineering	Not Accepted
4.	Tarez Walden	General Studies	Philadelphia Community College
5.	George Perkins	Business	University of Pennsylvania
6.	Randall Sellers	Liberal Arts	Syracuse
7.	Charles Mosby	Liberal Arts	St. Joseph's University
8.	Gina Henderson	Liberal Arts	Eisenhower College
9.	Elizabeth Sanders	Liberal Arts	Purdue University
10.	Belinda Howard	Education	University of Pittsburgh
11.	Geraldine Supplee	Business	Philadelphia Community College
12.	Sharon Sheppard	Liberal Arts	Albright
13.	Blanche Phillips	Working	
14.	Clarence Agnew	Working	
15.	Vamon Gaskins	U.S. Marines	

Of the 15 students in the experimental group, seven were enrolled in engineering in September 1980. One student planned to work one year and then enter an engineering school in September 1981. Accordingly, 8 of the 15 students will enroll in an engineering program by September 1981.

Overall, 13 of the 15 students will enroll in a college level program within one year's time. One student will enter the Air Force as an undeclared enlistee while still another will enroll in a training program to become a skilled craftsman.

Of the 15 students participating in the NSF III control group, only two had been admitted in an engineering program in the fall of 1980. One student applied for engineering at several institutions but, was not admitted in any college.

However, 11 of the 15 students were admitted to a program of higher education which attest to the calibre of the students participating in this project.

Two students were seeking employment and had no intentions of attending college while one enlisted in the U.S. Marines.

ANALYSIS AND EVALUATION OF THE PROJECT

An analysis of the data collected over the six year period (1975-80) and an evaluation of the entire project is presented in the final report submitted by the independent evaluator, Dr. Duane H. Sackett.

The writer has collected data and submitted a semi-annual progress report to NSF headquarters during the six year period and, based on these reports and other records, the independent evaluator, Dr. Duane Sackett, has summarized the overall goals, objectives, major findings, conclusions and made pertinent recommendations which other individuals, agencies and institutions of higher learning and community organizations can urilize in future projects of this nature.

Introduction

This evaluation report, the fourth and final of the series of such reports by an independent external evaluator, summarizes the major outcomes of NSF Project SED 74-177131402.

During the six year period (1975-80) the College of Engineering Technology of Temple University has conducted an experimental project at the pre-college level aimed at the early identification of disadvantaged minority students seeking careers in engineering and/or engineering technology. The program was specifically designed to encourage inner city Philadelphia black and Puerto Rican, 10th grade students who were proficient in mathematics and science to consider seeking careers in the fields of engineering technology. As previously reported, the entire program was jointly planned, executed and evaluated by Temple University staff, Philadelphia School District teachers and counselors, and local business and industrial personnel.

A sum total of ninety (90) students participated in some aspect of the project. The selection process extensively described in earlier summary reports proved to be most effective. Forty-five (45) of the ninety (90) students were classified as the experimental group and the remaining forty-five (45) as control. The control group did not participate in the Workshop and job placement phases of the program. Participants were selected in sets of thirty (30) each for a period of three years (1976-1977), fifteen assigned each year to the experimental group and fifteen to the control group. Follow-up data is available for all90 participants and has been extensively analyzed by the Project Director and verified by the independent external evaluator.

The phase one summary evaluation concerned itself with (1) describing the planning and development of the overall project, (2) the selection process and how it was developed, (3) a description of the Group I (1975) participants, and (4) an extensive evaluation of the Summer Workshop by students, faculty and parents.

Phase two summary evaluation summarized the preliminary findings of the results of the first two years 1975-76 of the project. It was a three part document that (1) summarized the activities and basic data relevant to Group II (1976) participants, (2) presented the findings related to those activities engaged in and attitudes surveyed of students, faculty and employers related to the phase two and three (1975-76) activities of Group I and II) part three summarized the combined major findings related to all activities participated in by Groups I and II.

The third year summary evaluation presented the major results obtained by the project in the first three years (1975-78). A tentative analysis of the extent of the success of the project was offered based on Group I students initial selection of Higher Education Institutions to attend and choice of major field. An extensive review was also presented of the predictive success factors for identifying potential engineering students enrolled in experimental groups I and II.

This final summary evaluation presents an overview of the major programmatic components utilized in this project. An assessment is offered of their functionality and effectiveness as each relates to their possible inclusion in similar programs designed for pre-collegiate minority students. Secondy the current career choices of all 90 students are summarized and presented with a composite breakdown of the (45) participants classified as the experimental and control groups.

Finally conclusions and recommendations are made based on the overall goals and objectives stated in the original proposal document. This final report is based upon an in-depth review of the semi-annual reports submitted by the Project Director, Dr. Theodore P. Vassallo in addition to any other relevant records and reports that were deemed applicable in making and/or validating this final report.

I. Programatic Components

The overall objective to develop a program geared at providing an experimental engineering career oriented program for tenth grade inner city Philadelphia youths was achieved. This goal was accomplished in the following manner. The project continuously involved staff employed by (1) Temple University College of Engineering Technology, (2) Philadelphia Public Schools and (3) a wide range of local and Philadelphia area business and industrial leaders.

Throughout the program there was an emphasis on maintaining a continuous and direct personal contact between Temple personnel and program participants in order for the students to obtain, early-on, the necessary motivation required to select careers in engineering and engineering technology. This aspect of the program was accomplished through Workshops, follow-up sessions, mini-workshops, job visitations, field trips, and career counseling sessions arranged for and attended by Temple University staff members.

It is the opinion of the external evaluator that all component parts and goals of the original proposal document were performed. This was verified in the following manner.

A. Develop A Valid Screening and Selection Procedure

Evidence has been periodically submitted to NSF concerning the validity of the cooperatively and specially designed selection and screening mechanism utilized in choosing the ninety participants in this project. The final results of the project in terms of the percentage (69 per cent) of students seeking further post secondary education in engineering and engineering technology and related higher education fields is overwhelming proof of the success of the selection criteria and process utilized in carrying it out. If only the experimental group is considered this overall percentage rises to 78 per cent.

B. Workshops

A variety of workshops were devised and offered.

1. Summer Workshops
   (a) Residential (1977)
   (b) Non resident (1978-79)
2. Mini Workshops
   (a) Career oriented
   (b) Electrical emphasis
   (c) Mechanical emphasis
   (d) Civil emphasis
   (e) Counseling sessions

C. Job Placements

Job placements in business and industry were successfully obtained throughout the duration of the program. A total of twenty-three private and public businesses, industrial firms, and governmental agencies provided summer jobs for program participants. In the majority of cases students received small salaries for their labors or at best carfare and lunch. This is a somewhat remarkable achievement of this program, (1) in light of the tight job market during the recessional period 1975-80 and, (2) the ages (15) of the students when requiring the initial work placement.

D. Follow-Up Sessions

A regular series of follow-up sessions were conducted on a semi-annual basis. During these sessions students were asked to evaluate their instructors, parents were queried about any problems they encountered and in several instances the participants participated in specially designed mini-workshops when job placements were not available.

E. Mini-Workshops

A series of mini-workshops were offered stressing electrical engineering concepts and mechanical engineering principles.

These were designed for those under age 16 who could not legally have summer job placements. Temple faculty reported that these workshops provided both them and the students a successfully and educationally rewarding set of learning experiences.

F. Job and Career Counseling

Regularly scheduled career guidance and counseling sessions focused on job placement and career counseling including on-site visits were carried out by the College Coordinator of Industrial Relations and the Project Director who also serves as the overall student counselor for the College of Engineering Technology.

G. Individual Personal Counseling

Individual guidance and counseling was provided throughout the life of the program on a scheduled and on request basis by the Director of the Project who serves the dual role of Associate Dean and Director of Counseling Services in the College of Engineering Technology.

H. External Funding

Several attempts to secure external funding other then that provided by NSF proved successful. These modest funds were obtained from a variety of business, civic, and industrial sources as well as from Temple University.

I. Industry Cooperation

Semi-annual reports point out the high degree to which industry supported the project beyond the initial expectations of the project managers. A large number of people gave freely of their time in planning and implementing the project. A wide variety of engineering and engineering related job placements were provided. A series of on-site field trip visits by students and faculty were welcomed by major industrial and governmental agencies.

J. Follow-Up Program

A semi-annual series of follow-up sessions were conducted by the Project Director and Temple engineering faculty members. Data was quickly analyzed and immediately utilized to strengthen the program. Follow-up information was obtained from the following sources.

1. Public School personnel, department chairpersons, guidance counselors, math and science teachers.
2. College of Engineering Technology, civil, electrical and mechanical engineering faculty. The Coordinator of Industrial Relations, Vice-President and Dean of the Faculty who was formerly the Dean of the College.
3. Temple University Department of Counseling Psychology,advanced doctoral students and faculty.
4. An independent evaluator from the College of Education at Temple University.
5. Business and industrial job supervisors.
6. Management personnel
7. Student participants
8. Parents

K. Role of Project Director

Dr. Theodore P. Vassallo serves as the Project Director. He is responsible for coordinating all of the activities of the experimental project and serves as a member of its management committee. In his role as project director he has performed the following functions: Coordinated and arranged for all activities of the program, (2) arranged for workshop staff, adequate teaching space and instructional materials, (3) continuously observed, documented and reported on the overall dimensions of the project, i.e. Workshops, field trips, school visitations, job placements and job site visitations, (4) regularly scheduled meetings with public school personnel participating in the project, (5) headed up the selection and management committees, (6) made personal contacts and visits to participating local businesses, industries and governmental agencies, (7) accompanied students and faculty on field trips, and (8) prepared and submitted the semi-annual reports, and (9) compiled and disseminated the required final project report.

Summary

It appears that the above data supports the conclusion that the project and its program has met the organizational goals and objectives stated in the original product document and subsequent proposal.

Individual program components proved attainable, feasible, functional and effective. The overall composite project design appears to be an effective model for urilization in solving complicated social problems and human resource needs. In addition this project is an example of the willingness of the federal government in combination with business, industry and local governments to provide opportunities to minority students though utilizing the resources of an institution of higher learning.

It should be possible to adapt this model program with minor modification to provide additional manpower and/or opportunities for pre-collegiate students to enter other professions. Certainly, it could be a viable model easily adaptable towards providing and encouraging talented inner city minority youth to consider careers in the Arts and Humanities. This type of project has many social, economic and political ramifications and warrents careful analysis by government and educators to determine its utility in societies continuous battle to provide suitable, efficient and cost effective solutions to major social problems.

II. Student Career Choices

A. Demographic Information

1. Ninety (90) inner city Philadelphia black and Puerto Rican students participated in the project and its program. Forty-five (45) were classified as the experimental group and the remaining forty-five (45) comprised the control group. They were selected in groups of thirty (30) during the years 1975-77.

2. Of the ninety (90) participants forty-three (43) were females and forty-seven (47) males. Percentage wise this distribution of males to females(52 per cent to 48 per cent) is not considered statistically significant in any analysis of the data.

3. The experimental group consisted of twenty-five (25) females and twenty (20) males. (Fifty-six per cent vs. forty-four per cent)

4. The control group consisted of eighteen (18) females and twenty-seven (27) males. (Forty percent vs. sixty per cent)

5. A total of sixty-two (62) of the ninety (90 program participants (69 per cent) have chosen to attend or are attending a college or university.

6. Twenty-seven (27) of the ninety (90) students have enrolled or are previously enrolled in Engineering programs. (30 per cent) Of these twenty-seven, twenty (20, or 74 per cent) were in the experimental group and the remaining seven (7, or 26 per cent) in the control group.

7. Of the forty-five students in the experimental group, twelve (12) women and eight (8) males chose to attend or are enrolled in a collegiate engineering program. These twenty students comprise forty-four (44 per cent) of the experimental group.

8. Of the forty-five students in the control group three (3) women and four (4) men chose to attend or are enrolled in a collegiate engineering program. These seven constitute sixteen (16 per cent) of the control group students.

9. Of the forty-three (43) females participating in the project thirty-three (33 or 77 per cent) chose or have chosen to enroll in an institution of higher education upon graduation from secondary school.

10. Fifteen (15) of the forty-three females chose to attend an engineering school and pursue an engineering curricula (35 per cent) Of the experimental group of twenty-five (25) women, twelve (12 or 48 per cent) chose to enroll in an engineering course.

11. Twelve (12) of forty-seven (47) males involved in the project (26 percent) opted to enroll in an engineering program upon graduation from high school.

12. Twenty-nine (29) of the forty-seven (47) males have chosen to enter a post secondary school upon graduation from high school (62 per cent).

13. Only ten (10 or 22 per cent) of the females enrolled in the program did not chose to attend an institution of higher education from secondary school.

14. Of the forty-seven males involved in this experimental project a total of eighteen (18 or 38 per cent) decided against entering a post secondary institution.

15. Five (5 or 28 per cent) of the eighteen (18) males who did not chose to attend a college or university enlisted in the military.

16. Several (3) of the students reported that they were married and that family responsibilities negated against their attending a college or university at this time.

17. Of the twenty-eight (28) students who were not able to attend a post secondary institution, eighteen (18 or 64 per cent)of them hoped to enroll in an engineering or engineering technology program in the near future.

18. The students who participated in this project who chose to enter higher education were accepted at thirty-two (32) institutions throughout the United States.

Summary

An analysis of the career choices based upon actual enrollment data in higher education institutions indicates that a large majority of participants in this experimental project have enrolled in post secondary education programs. As predicted in previous summary reports almost one half of the students selected for the experimental group were qualified and chose to enter an engineering school upon graduation from high school. Those students (control group) who had less involvement in the project were less inclinded to enter engineering programs upon completion of the secondary education.

It appears that females who have predictable evidence of success in engineering related programs based on early identification of high mathematics and science ability scores who are given appropriate counseling and in depth training will chose to enter engineering and/or engineering technology related fields.

Some evidence exists to indicate that highly qualified low income inner city minority black and Puerto Rican students will opt to use the military as a means to provide them with additional training in engineering related fields and allow them to obtain the future financial assistance required to allow them to attend an institution of higher education in order to pursue a career in engineering or related fields.

Clearly the data points out that given an extensive orientation and opportunity to explore in depth the field of engineering both male and especially academically qualified female pre-collegiate students who are given adequate counseling and guidance and related educational experiences will chose to enroll in post secondary education programs in engineering and/or related fields. In the event that this total emersion in the concepts and principles related to the fields of engineering or engineering technology are not appealing to these academically talended students, they still opt to attend a college or university upon graduation from high school. In every instance students who were involved in the experimental group indicate that they have had an invaluable learning experience through their participation in this program.

Surprisingly the students who entered institutions of higher education chose schools and programs throughout the United States. Apparently the quality of the students made them academically acceptable to some of the most prestigious schools and colleges in the nation. Possibly the fact that they were selected to participate in this experimental project and the knowledge gained through their exposure to the concepts and principles of engineering helped them to gain admission to such a wide range of post secondary institutions.

III Conclusions and Recommendations

1. The program developed by the College of Engineering Technology met the goals and objectives for which it was designed.

2. A valid screening and selection process was designed and utilized to identify and select tenth grade inner city black and Puerto Rican students who were proficient in mathematics and science.

3. High School students can handle collegiate level course work especially designed for them by university faculty members.

4. University engineering faculty were capable of designing laboratory experiences and developing course content suitable for academically talented secondary school students.

5. Females can be attracted to preparing for careers in engineering and engineering related fields.

6. Business, industry and governmental agencies are willing and eager to assist in the development and carrying out of programs aimed at helping disadvantaged minority secondary students.

7. Similar projects such as this one can be developed to identify and assist talented inner-city minority youths in considering undertaking a career in the Arts and Humanities.

8. Even though an experimental project has a particular career orientation some participants will continue to chose entering other professional fields after their participation in the program.

9. Black and Puerto Rican academically talented inner-city youth will eagerly take advantage of and make personal sacrificies in order to avail themselves of educational opportunities.

10. Many times these good mathematics and science students found it difficult to decide upon which one to accept of the multiple opportunities for participation in special projects that are available to them.

Recommendations

1. Higher education institutions should be encouraged to replicate and/or develop similar pre-collegiate programs aimed at the early identification, selection and encouragement of gifted and talented students to consider embarking upon careers in other professional disciplines.

2. The model program developed by Temple University should be adopted by other urban institutions charged with helping inner-city minority youths embark upon careers in engineering technology or related fields.

3. Means should be provided to carry out a longitudinal study of the 90 students through the completion of their first degrees in 1984.

4. The results of this project should be widely disseminated by the Temple staff to members of the engineering and education professions.

5. Local business, industrial and civic leaders should be encouraged to continue developing model experimental training programs for a variety of special interest groups and purposes.

6. The College of Engineering Technology should be encouraged to continue developing model experimental training programs for a variety of special interest groups and purposes.

7. College of Engineering Technology administrators faculty and staff should continue seeking out international, national, state and local sources of funding for their experimental projects.

APPENDIX

1. Table I — Distribution of Students by Group and Sex
2. Graph I — Percentage of Males and Females in the Experimental Group
3. Graph II — Percentage of Males and Females in the Control Group
4. Graph III — Percentage of Males and Females in both Experimental and Control Groups
5. TABLE II — College Plans of the Experimental and Control Groups
6. Graph IV — Percentage of NSF I Students Enrolling in Engineering Schools
7. Graph V — Percentage of NSF II Students Enrolling in Engineering Schools
8. Graph VI — Percentage of NSF III Students Enrolling in Engineering Schools
9. Graph VII — Percentage of all NSF Students Enrolling in Engineering Schools
10. Graph VIII — Percentage of all NSF Students Enrolling in all Types of Institutions of Higher Learning
11. Bar Graph — Time Schedule for Each NSF Group
12. Employers Evaluation Form
13. Student's Industry Report
14. Student's Work Experience Evaluation Form
15. Guidelines for Employers

ENGINEERING TECHNOLOGY CAREER PROGRAM

DISTRIBUTION OF STUDENTS

by

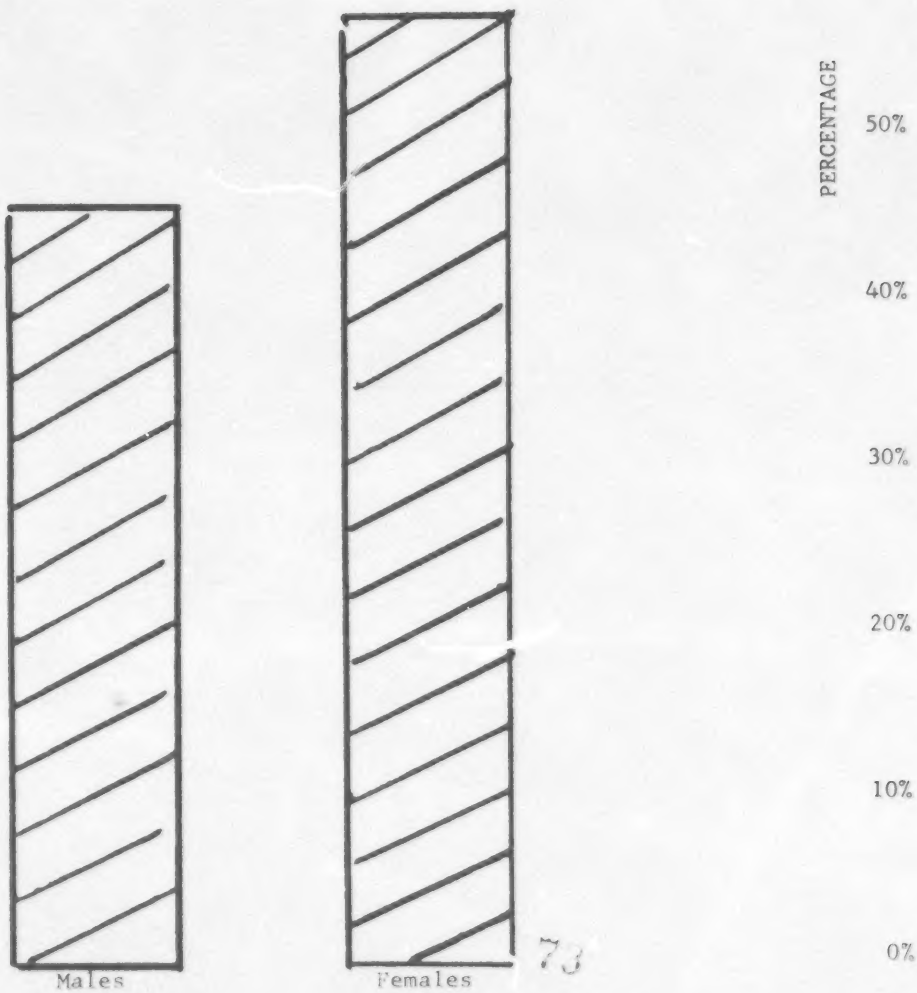
GROUP AND SEX

TABLE I

Workshop	EXPERIMENTAL GROUP		CONTROL GROUP	
	Males	Females	Males	Females
NSF I Summer 1975	7	8	13	2
NSF II Summer 1976	7	8	8	7
NSF III Summer 1977	6	9	6	9
TOTALS	20	25	27	18

Graph I

Percentage of Males and Females in the Experimental Groups



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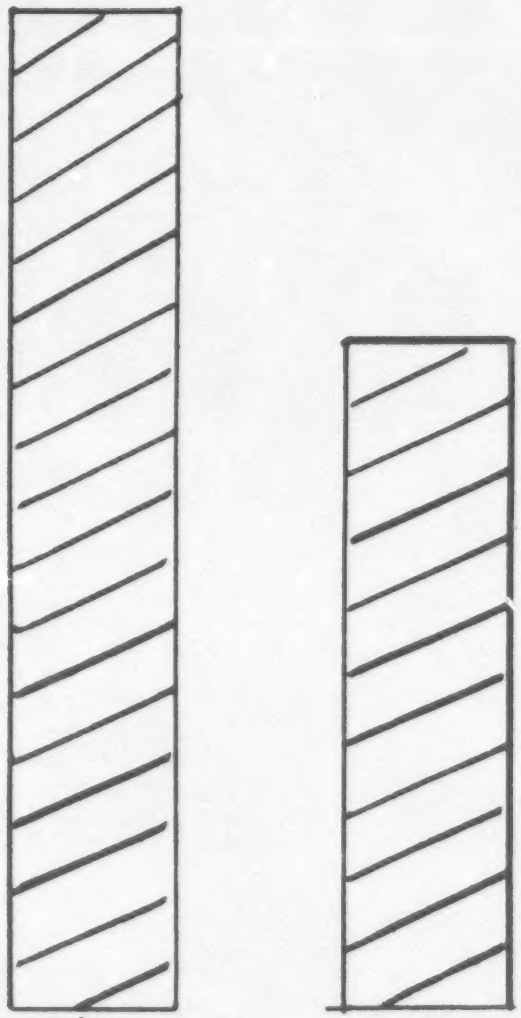
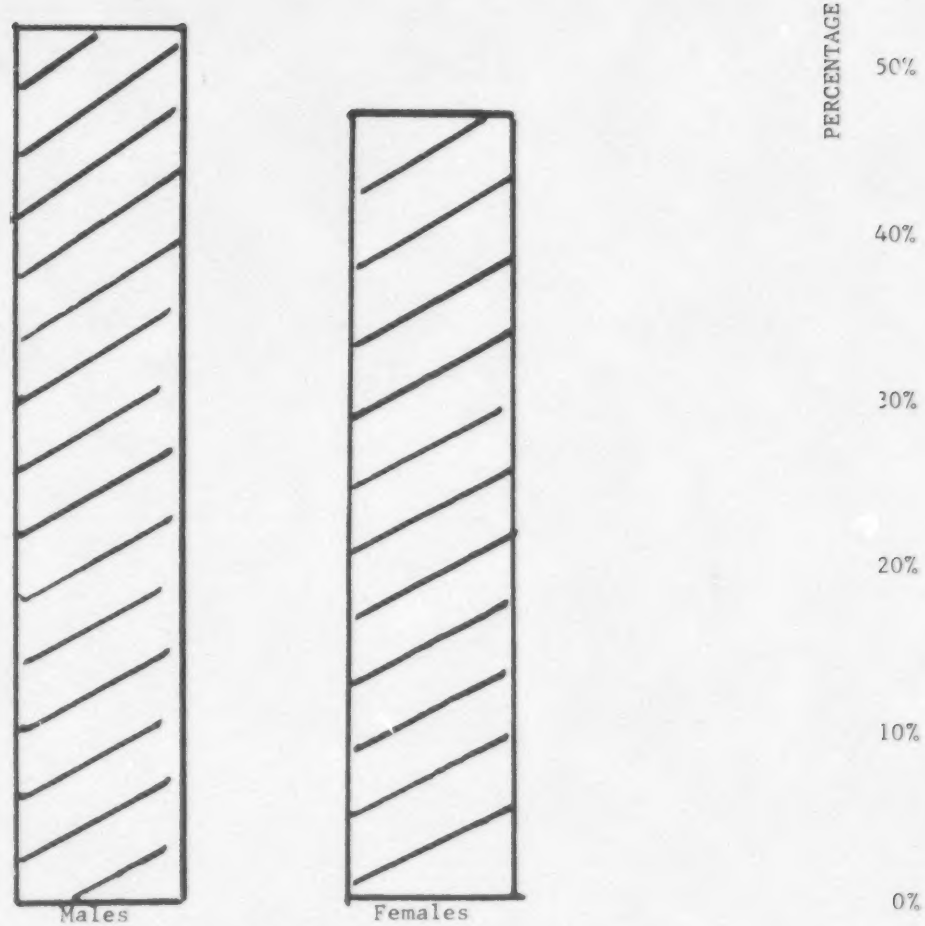
Graph II

Percentage of Males and Females in the Control Groups



Graph III

Percentage of Males and Females in the Experimental and Control Groups



ENGINEERING TECHNOLOGY CAREER PROGRAM

COLLEGE PLANS

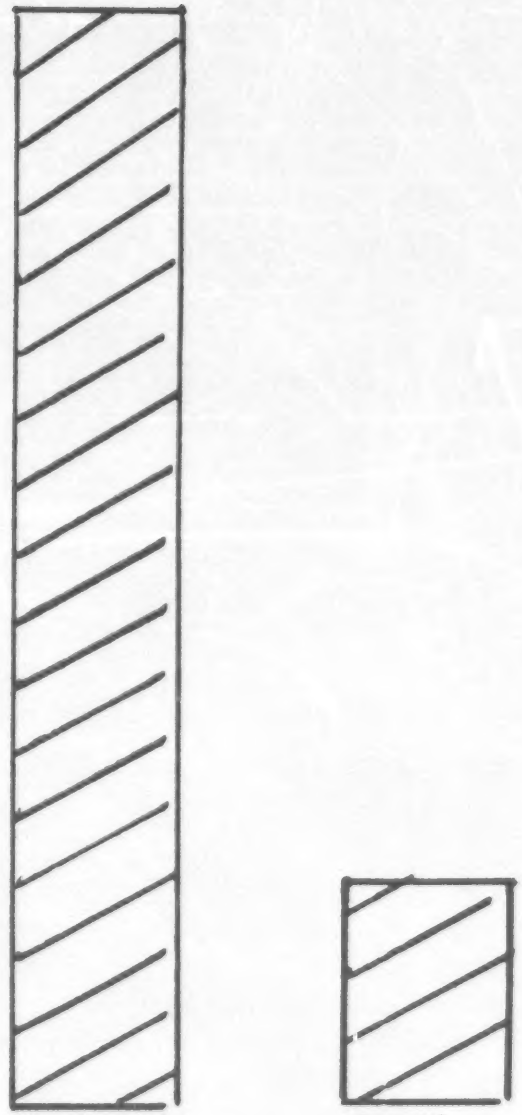
of the

EXPERIMENTAL AND CONTROL GROUPS

Workshop	EXPERIMENTAL GROUP		CONTROL GROUP	
	Engineering Colleges	All Colleges	Engineering Colleges	All Colleges
NSF I Summer 1975	10	13	2	
NSF II Summer 1976	9	14	1	5
NSF III Summer 1977	7	12	2	9
TOTALS	26	39	5	22

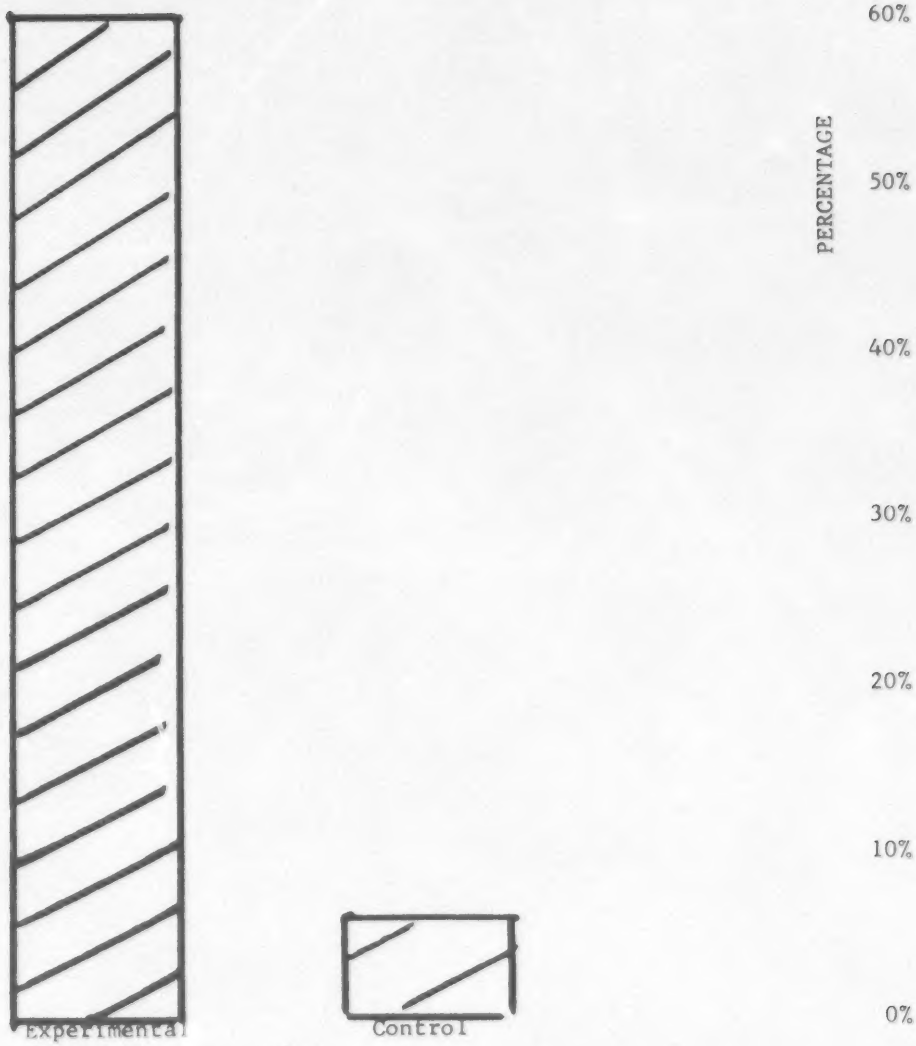
Graph IV

Percentage of NSF I
Students Enrolling
in Engineering School



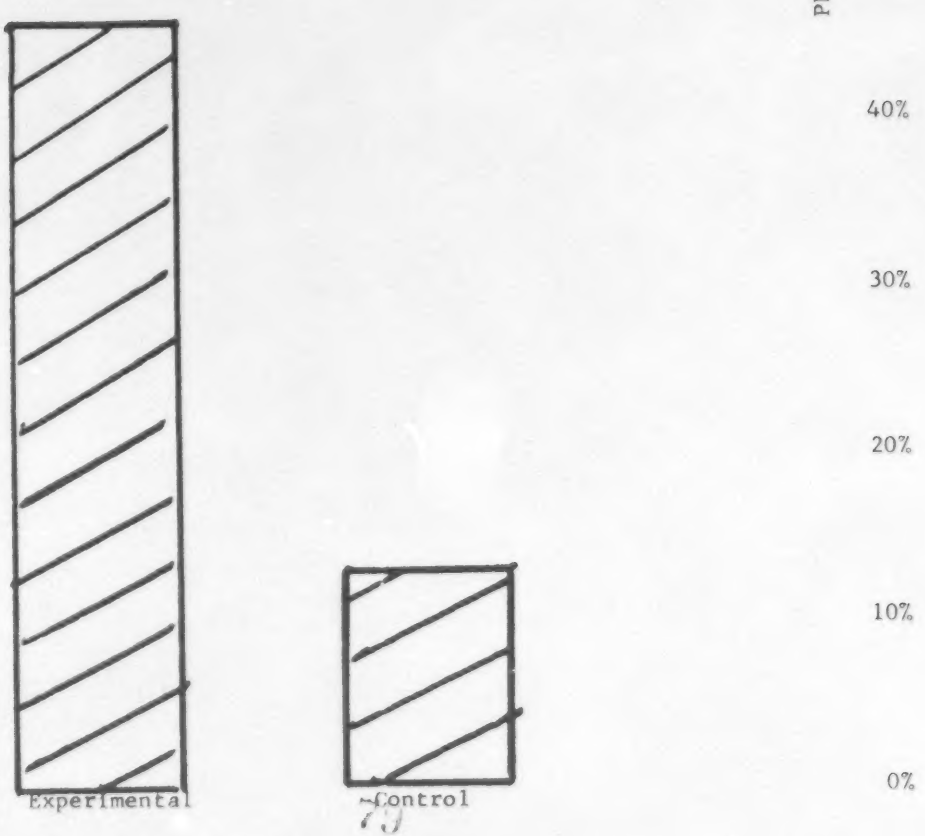
Graph V

Percentage of NSF II Students Enrolling in Engineering Schools



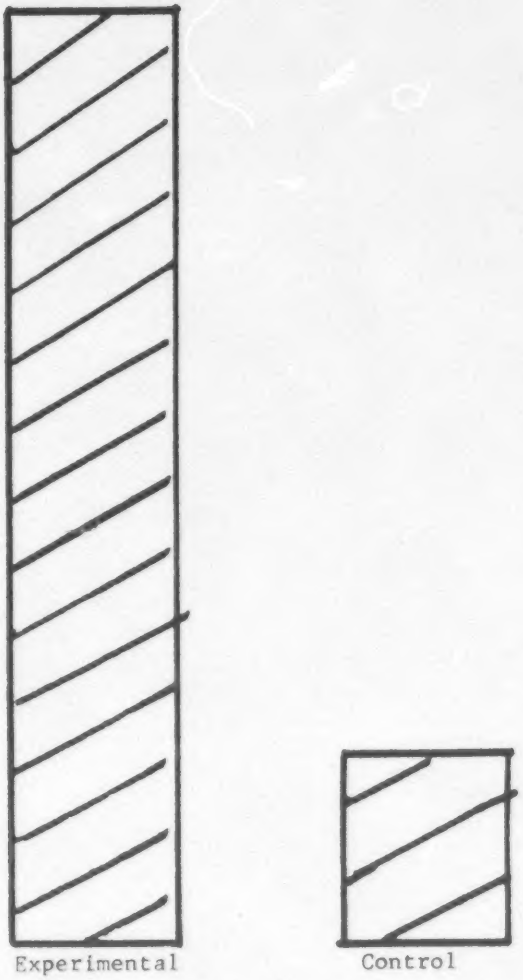
Graph VI

Percentage of NSF III Students Enrolling in Engineering Schools



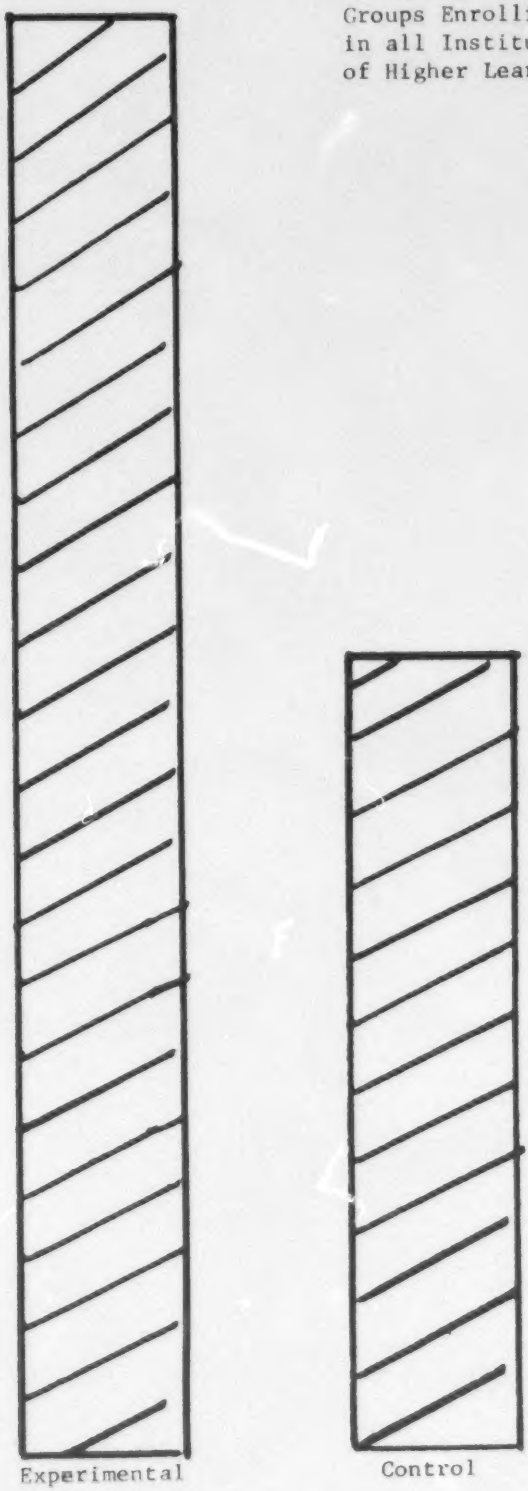
Graph VII

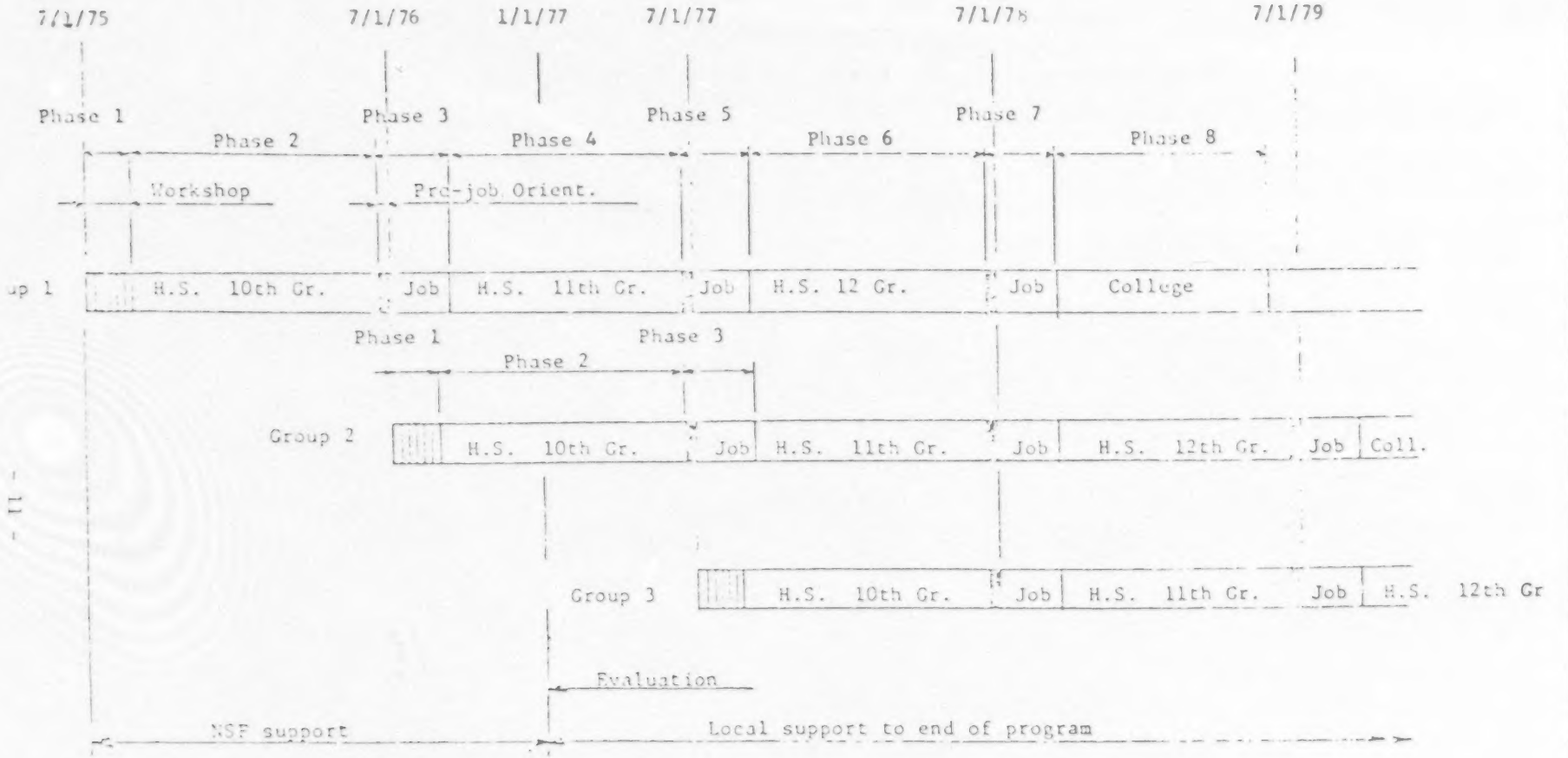
Percentage of all Groups Enrolling in Engineering Schools



Graph VIII

Percentage of all Groups Enrolling in all Institutions of Higher Learning





Engineering Technology Career Program for Disadvantaged Minority Students

College of Engineering Technology
Temple University
Philadelphia, Pa.

TEMPLE UNIVERSITY

COLLEGE OF ENGINEERING TECHNOLOGY

PHILADELPHIA, PENNSYLVANIA 19122

EMPLOYER'S EVALUATION OF NSF STUDENT

Information, as checked in the space below, will assist Temple University in its appraisal and counseling of the NSF student.

Name of Student _____

DATE TERM COURSE

Cooperating Employer _____

Company Address:

INSTRUCTIONS: The immediate supervisor will please evaluate the student objectively, comparing him with other students of comparable academic level, with other personnel assigned the same or similarly classified jobs, or with individual standards.

RELATIONS WITH OTHERS

- ☐ Exceptionally well accepted
- ☐ Works well with others
- ☐ Gets along satisfactorily
- ☐ Has some difficulty working with others
- ☐ Works very poorly with others

ATTITUDE -- APPLICATION TO WORK

- ☐ Outstanding in enthusiasm
- ☐ Very interested and industrious
- ☐ Average in diligence and interest
- ☐ Somewhat indifferent
- ☐ Definitely not interested

JUDGMENT

- ☐ Exceptionally mature
- ☐ Above average in making decisions
- ☐ Usually makes the right decision
- ☐ Often uses poor judgment
- ☐ Consistently uses bad judgment

DEPENDABILITY

- ☐ Completely dependable
- ☐ Above average in dependability
- ☐ Usually dependable
- ☐ Sometimes neglectful or careless
- ☐ Unreliable

ABILITY TO LEARN

- ☐ Learns very quickly
- ☐ Learns readily
- ☐ Average in learning
- ☐ Rather slow to learn
- ☐ Very slow to learn

QUALITY OF WORK

- ☐ Excellent
- ☐ Very good
- ☐ Average
- ☐ Below average
- ☐ Very poor

ATTENDANCE: ☐ Regular ☐ Irregular **PUNCTUALITY:** ☐ Regular ☐ Irregular

OVER-ALL PERFORMANCE:

Outstanding	Very Good	+ Average —	Marginal	Unsatisfactory

What traits may help or hinder the student's advancement?

Would you rehire this student? YES _____ NO _____

Additional Remarks (over if necessary):

This report has been discussed with student ☐ Yes ☐ No

Rated by _____ Title _____ Dept. _____

Endorsed by _____ Title _____ Dept. _____

TEMPLE UNIVERSITY

COLLEGE OF ENGINEERING TECHNOLOGY

STUDENT'S INDUSTRY REPORT

Cooperative Program

Instruction: The accompanying report of between 500 and 1000 words will be written on 8½" x 11" white unruled paper.

See additional instructions on reverse side.

Student _____ Date _____
(Last) (First) (Middle)

Class _____ School _____ Major _____

Name of Company _____

Address of Company _____
(Street) (City) (State)

Personnel Manager _____ Department Head _____

Immediate Superior _____ His Position _____

Security Clearance Granted _____
(Kind) (By Whom)

Date Started Work _____ Termination Date _____

Rate of Pay _____ Total Take Home Pay for Period _____

Job Description _____

_____

_____

Name of Person to whom this report was submitted for screening:

_____ Screened: Yes ____ No ____

TEMPLE UNIVERSITY COLLEGE OF ENGINEERING TECHNOLOGY

NATIONAL SCIENCE FOUNDATION CAREER WORKSHOP PROGRAM
OBSERVER EXPERIENCE
EVALUATION FORM

1. NAME _____
Last First Middle

2. ADDRESS _____
Street City State Zip

3. TELEPHONE _____ SOC. SEC. NO. _____

4. NAME OF COMPANY _____ DATES ATTENDED _____

5. NAME OF SUPERVISOR _____ HOURS THERE PER WEEK _____

6. Mention some of the more important experiences you had at this company.

7. Did these experiences help you better understand engineering as a career objective?

Yes No

8. Rate your experience at this company.

Excellent Good Satisfactory Unsatisfactory

9. If your rating of this company is unsatisfactory, please explain.

10. What do you recommend to better improve observer experiences for future students?

Signature _____ Date _____

(Note: Use reverse side for any additional comments or continuation)

TEMPLE UNIVERSITY COLLEGE OF ENGINEERING TECHNOLOGY

February 16, 1976

NATIONAL SCIENCE FOUNDATION SUMMER PLACEMENT

GUIDELINES FOR EMPLOYERS

1. What is the exact age of each participant?

   By next July 1 (1975), ten (10) of the participants will be 15 years of age and five (5) will be 16 years.

2. What is the legal age of employment?

   A boy or girl must be at least 16 years of age to:
   Work in, about or in connection with any manufacturing or mechanical occupation or process.
   Be a public messenger.
   Do any heavy work in the building trades.
   Work in building construction, wholesale houses, warehousing, storage and stock room occupations (except office and sales).
   Work on scaffolding.
   Work on any railroad or boat.
   Work in communication and public utility occupations (except office or sales).
   Move an automobile in a parking lot.
   Load and uhload goods to and from trucks, railroad cars or conveyors.

3. What is the objective of the observer experience?

   - See engineer in action
   - Learn about working world
   - To gain understanding of proper work habits

4. What is the length of the observer experience?

   - Hrs/day = 4
   - Days/week = 4 (Monday thru Thursday)
   - No. of weeks = 6 (July 1, 1976 thru August 13, 1976)

5. What are the number of participants per company?

   A strong plea is made to have a sponsor agree to arrange observer experiences for at least two (2) of the participants. This will enable an interchange of ideas and concepts among participants as well as among various departments within the sponsoring organization.

6. What stipend is requested from a sponsoring organization?

   Amount of stipend = Hourly Wage x Hrs/week x Wks.
   = ($2.00) (16) (6)
   = $192.00

   In addition, each sponsor will be requested to furnish carfare and lunch, if possible, for the participants:

   Estimated Costs
   Lunch: 24 days @ $1.25/day = $30.00
   Carfare: 24 days @ $1.00/day = $24.00

   Total Stipend = $192.00 + $30.00 + $24.00 = $246.00 per student participant.

FSW:mk

Prepared by: F. S. Woerth

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